THE UNIVERSITY
OF ILLINOIS
LIBRARY

657
K837c
cop.2

ALTGELD HALL ANNEX
ENGINEERING
LIBRARY

Due

WITHDRAWN
University of
Illinois Library
at Urbana-Champaign

COST ACCOUNTING FUNDAMENTALS

From the Standpoint of Management

By

L. T. KONOPAK

Member of the firm of Konopak, Hurst and Dalton;
Certified public accountant (Ohio and Indiana)

NEW YORK
THE RONALD PRESS COMPANY
1924

Copyright 1924, by
THE RONALD PRESS COMPANY

All rights reserved.

657
K837c
cop. 2

PREFACE

The primary object of this volume is to present the subject of cost accounting in clear perspective so that the reader can grasp it as a whole, particularly as to its bearing upon management. To this end the author has striven to keep his discussion as simple as possible. The illustrations used are largely of simple hypothetical nature, devoid of the complicating details that go with an actual working cost system.

For lack of full understanding of their cost systems those attempting to manage a business very often fail to gain any appreciable benefit from their use. In not a few cases they are even unable to obtain proper interpretation of the cost data from their accountants, whose too exclusive attention to details blinds them to the larger and more significant facts, from the managerial standpoint, developed by the cost records. Books on cost accounting, however excellent, have sometimes been so cumbered with detail, relating not only to costing procedure but also to technical processes in unfamiliar industries, as to be difficult for the executive reader to follow. In preparing the present volume this point has been constantly borne in mind.

The scheme of treatment involves a threefold division of the subject matter.

Part I deals with general cost accounting principles—the various methods of accumulating cost figures, the different bases for distributing overhead, and the cost controlling accounts, a full set of pro forma journal and general ledger entries being given.

Part II discusses the preparation of certain final statements —the general and departmental overhead statements, and the

568259

profit and loss statement. It also enters at some length into the question of the normal-rate distribution of burden, laying stress on the advisability in business depressions of selling goods at a loss to prevent a greater loss from unabsorbed overhead, and describing a graphical method of ascertaining what volume of business must be done under given conditions to break even as between selling value and cost.

Part III presents comprehensive illustrations, with forms in general use, of the practical operation of the three most common cost systems. The procedure involved in each case is explained step by step from the preparation of the primary records until the data are reflected in the general ledger accounts.

The conditions found in the factory of average size are considered in these pages; the cost requirements of the large or the small factory are merely modifications of those here outlined. Special effort has been made to show the connection of the cost system with the general books of account, and the principles of cost accounting are discussed throughout with constant reference to the uses of cost accounting, so that the cost accountant may clearly perceive the ultimate purpose of the cost work and the executive may grasp its significance in relation to his own duties.

L. T. KONOPAK

Toledo, Ohio
January 1, 1924

CONTENTS

Part I—Principles of Accumulating Costs

Chapter		Page
I	Cost Accounting as a Tool of Management	3
II	Direct and Indirect Costs	7
III	The Operation of a Cost System	13
IV	Factory Orders	20
V	Methods of Accumulating Costs	27
VI	Material Costs	31
VII	Labor Costs	43
VIII	Overhead or Burden Costs	50
IX	Distribution of Overhead	60
X	Cost Controlling Accounts	70
XI	Planning the Design and Size of Forms	80

Part II—Operating Statements and Uses of Costs

XII	Preparation of Overhead Statements	85
XIII	The Profit and Loss Statement	100
XIV	The Cause and Effect of Unabsorbed Overhead	114
XV	The Effect of Unabsorbed Overhead Illustrated	123
XVI	Determining the Volume of Business Required.	147

Part III—Illustrations of Cost Systems

XVII	Variations in Cost Methods	161
XVIII	Order or Job Cost System Illustrated	165
XIX	Process Cost System Illustrated	190
XX	Operating Unit Cost System Illustrated	208

LIST OF ILLUSTRATIONS

Figure		Page
1.	Manufacturing Overhead Statement	87
2.	Monthly Profit and Loss Statement	101
3.	Fixed Overhead Budget	140
4.	Chart Showing Operating Results from Different Volumes of Business When Entire Production Is Sold	143
5.	Chart Showing Operating Results, Exclusive of Overhead Variance, from Different Volumes of Business	144
6.	Chart Showing Unabsorbed or Overabsorbed Overhead	145
7.	Chart Showing Amount of Business Necessary to Overcome an Experienced Loss	149
8.	Chart Showing Effect of Changes in Selling Price and Variable Items of Cost	154
9.	Chart Showing Amount of Business Necessary to Overcome an Experienced Loss When Production Is Equal to Sales Requirements	156
10.	Stock Record Card	173
11.	Receiving Slip	175
12.	Return Purchase Slip	176
13.	Requisition Form	178
14.	Daily Time Ticket	179
15.	Cost Sheet	180
16.	Transfer Slip	182
17.	Comparative Cost Record	183
18.	Shipping Order	184

FIGURE PAGE

19. Repair Order 185
20. Report of Material Used 198
21. Report of Finished Castings 200
22. Daily Time Ticket 201
23. Cost Sheet 202
24. Summary of Overhead Distributed 204
25. Shipping Report 205
26. Stock Record 217
27. Receiving Slip 218
28. Report of Material Cut 219
29. Report of Supplies Used 220
30. Production Report 222
31. Report of Articles Completed 223
32. Cost Sheet 224
33. Summary of Cost—Completed Articles 226

Principles and Uses
of
Cost Accounting

PART I
PRINCIPLES OF ACCUMULATING COSTS

CHAPTER I

COST ACCOUNTING AS A TOOL OF MANAGEMENT

Definition and Purpose of Cost Accounting

Cost accounting may be defined as a method of allocating to the manufactured product all expenditures for the normal operation of a factory. The expenditures may first be segregated according to their initial purpose and then redistributed to other segregations, following the sequence of the factory operations, until eventually they are charged against the product shipped from the factory.

The object of a cost system, as the name implies, is to determine costs. Its primary purpose is to aid those in charge of the operation of a factory in attaining greater efficiency. Thus, the cost system must serve to determine through experience minimum costs from which standards may be established as goals to be attained in future production; to safeguard the maintenance of those standards, or to establish new, lower standards in subsequent operations; to assist in the assignment of work to employees best fitted for it; to hold to accountability those responsible for the various items of cost; and to determine the unit profit arising from the sales of various articles made in the same factory.

The cost system presents a financial history of the operations of a factory. It is not in itself corrective; it merely points the way to better results. But its aid must be sought. To reap the benefits from it, the figures must be constantly analyzed and used as a guide for present and future operations. It will prevent a repetition of the errors of the past.

Aid to Financial and Marketing Executives

The profits resulting from the sales of the product depend not only upon the marketing costs but upon the manufacturing costs as well. Selling prices are often built upon the manufacturing costs as a foundation, and as they may be a vital factor in securing business, the financial and marketing executives are also concerned with the costs of manufacture. Particularly for their benefit, the costs should always be computed upon the basis of normal production, regardless of the actual production. The cost system should aid them in determining the volume of production required to operate the factory at its normal capacity, so that a corresponding sales quota may be established; and it should also assist them in locating the cause of fluctuating profits or losses when no changes have been made in the material cost of the product or in the wages and personal efficiency of the employees.

Every executive should know the capacity of his factory and its sales requirements. When production is below the normal possibilities of the factory, he should know the amount of the resulting loss so that he may investigate and eliminate the causes. It may even be profitable to take some large orders at a slight loss, at least until the production is restored to normal. Such problems constantly confront the executives of a factory and can be solved only with the aid of a cost system. Without a cost system no executive can intelligently direct the affairs of a factory through a business crisis, for no dependable information is available from which the effect of the changes continually required in the operations may be anticipated.

Effect of Cost Reduction on Profits

The making of a profit does not begin or end with a system. A system is merely a necessary adjunct to the making of the most profit from a series of operations, and the more numerous the operations are, the more vital is the need of a system.

Profits are made from sales; systems assist in reducing costs and thereby increase the profits. A slight reduction in the costs may have an enormous effect upon the net profits. If it amounts to only a small percentage of the total costs, the saving is a much larger percentage of increase in the net profits. If an article sells at a profit of 5 cents and costs $1, including the purchase price of the materials composing it, the labor directly applied on it, and its share of all operating expenses, a reduction in cost aggregating a total of only 1 cent per article, or 1 per cent of all the elements included in its cost, will produce an increase of 20 per cent in the net profit. It would take almost a 20 per cent increase in the sales to effect the same result. Furthermore, if the net profit is equal to 10 per cent of the costs, a reduction of 10 per cent in the costs will increase the net profit 100 per cent. This may be better illustrated if it is assumed that the operating results of a factory during its first year are as follows:

Sales	$110,000
Costs, including all expenses	100,000
Net profit	$10,000

Presuming that the sales for the second year are also $110,000, but that upon analyzing the detailed figures making up the costs of the first year, certain extravagances are uncovered and eliminated in the second year, which produce a saving equal to 10 per cent of the costs, the results will then be as follows:

Sales	$110,000
Costs, including all expenses	90,000
Net profit	$20,000

In comparing the two statements it will be seen that in the

second period a saving of $10,000 is effected and the profits are accordingly increased. The saving in costs, equal to 10 per cent, makes a 100 per cent increase in the profit, doubling the possible amount available for dividends.

The truth of the foregoing illustrations is so evident that it is frequently unnoticed. The illustrations are given merely to emphasize the possible value of a cost system when properly used by the executives.

Outline of Treatment

Accumulating costs and using costs present two distinct subjects. The first is the problem of the accountant and the second is the problem of the executive. As the first is the means to the second, it is necessary for the accountant to be familiar with the uses of a cost system, beyond the mere accumulation of cost figures, so that his statements will be prepared in a manner that will facilitate the work of the executives. Likewise, before proper use of a cost system can be made by the executives, it is necessary that they fully understand the principles underlying the methods of accumulating the costs. Each of the two subjects is presented herein with constant regard for the other. The subject of accumulating costs and the principles underlying the methods employed are treated in the following chapters of Part I. The operating statements, the financial effects of production deviating from normal, and the executives' problem of using the costs are discussed in Part II. Three distinct types of systems of cost keeping, with descriptions of all forms required, and the journal entries preparing the general books for the profit and loss statement, are given in Part III.

CHAPTER II

DIRECT AND INDIRECT COSTS

Three Elements of Cost

A complete cost system must provide for the segregation of every expenditure made directly or indirectly in the creation of the completed product from the basic materials. In the manufacture of every article there are three elements into which all items of cost may be classified: (1) the material evidenced in the completed article; (2) the labor of working the material into its completed shape; and (3) the expenses of all kinds incurred in the operation of the factory during the process of converting the material from the shape in which it entered the factory into the finished article. The expenses of operating and maintaining the factory are commonly called "overhead" or "burden." Briefly stated, the three elements of cost are material, labor, and overhead.

Manufacturing, and Administrative and Selling Costs

The business of a manufacturing industry is divided into two distinct units for the purpose of accounting—one, manufacturing, and the other, administrative and selling. Each group may be further subdivided according to the requirements of the particular business. All expenditures incident to the manufacturing operations are segregated in one group of accounts, and the administrative and selling activities are recorded in another group. The manufacturing costs end with the manufacture and completion of the product, and therefore include only those expenses which are incurred in the operation of the

production departments. When the product is sold, the gross profit—the excess of the amount realized from sales over the factory costs of the product sold—must provide for the expenses of selling, operating the general office, and delivering the product.

To understand cost accounting it is always necessary to visualize the factory operations. It will then be more easily seen why it is necessary to separate the manufacturing expenses, or factory overhead, from the administrative and selling expenses. Following the sequence of the physical operations, first the basic or raw materials are received and stored until they are required for production and withdrawn from the stockroom for manufacture. Labor, aided by the use of equipment, plans, and all factory accessories, then converts the basic materials into the completed article or its components. In most cases the product is manufactured in anticipation of sales and may remain, ready for delivery to eventual customers, in the possession of the manufacturer for some time. Therefore, factory costs end at this point and include the cost of the material and labor used, plus a pro rata share of the factory operating expenses commonly called "overhead."

Two distinct activities are plainly evidenced—first, that of manufacturing, and second, that of marketing. The factory cost is the cost of an article as it is delivered from the manufacturing departments to the stockroom. There the manufacturing activities end and the marketing begins. While merchandise remains in stock, whether manufactured by the owner or purchased from others, its value should not be enhanced by adding an amount to cover the cost of selling it at some future time. Its inventory value to the maker should not exceed its cost of manufacture. When the article is sold, its portion of the selling, delivery, and office expenses may be added to its factory cost to determine the cost delivered and the resulting net profit.

Direct and Indirect Costs

There are items in each of the three elements of cost that may be *directly* accounted for in figuring the cost of an article, or that may be *indirectly* apportioned to it. In other words, there are direct and indirect costs. The direct cost of an article includes all materials and special expenses which can be accounted for by a direct charge against the article. Indirect costs include all the items which cannot be *practicably* charged in their entirety directly to the article being made. They are the costs which are not incurred for any one job but are necessary to the operation of the factory as a whole. They are the costs usually segregated under the term "overhead" and are apportioned to the operations benefited.

Treatment of Insignificant Direct Items

The nature of the material does not determine whether it should be handled as a direct or indirect item of cost. That must be determined in each instance from its use or comparative value. There are items that may become a tangible part of the completed product, such as a few small rivets in an article costing approximately $500, but which would not be classified as direct material on account of their negligible value. The time and forms used to record their use as direct material would cost several times that of the rivets. They are included in the manufacturing expenses and apportioned through the overhead figures unless their requirement is predetermined and recorded on requisitions made from established specifications.

The direct labor cost is figured from reports of the time consumed by each employee in performing the operations necessary to complete the product. This also is limited to its practicable extent. It would be ridiculous to attempt to distribute, as a direct charge, the cost of the time consumed by a trucker employed to cart numerous jobs from one operator to another. The amount of time that he could charge to each job would be

extremely small, and the number of jobs over which his time would be distributed would be so numerous that it would almost require a clerk to follow him around and keep his record of time. In each factory there will also be found employees who perform minor operations directly on the product, but as their work is so divided as to make it impracticable to account for the time consumed on each job, their wages are not treated as a direct cost, but are included in the overhead as an item of indirect cost and apportioned to all jobs performed in the department.

Handling of Certain Expenses as Direct Costs

It is perhaps more rare to find items that are usually considered as an expense treated as a direct cost. Ordinarily the cost of electric current is considered a part of overhead, but in a factory manufacturing and charging storage batteries, it becomes of such importance that it is necessary to allocate it as a direct cost and not to include it with the other items of overhead.

When figuring depreciation on machinery, the charge is based upon an average for all machines in the department. When proved by time, it is found that the rate upon which the charge is based is wrong in each individual case, but the average for all machines is approximately correct. Likewise, a detailed analysis of the items distributed as overhead will disclose that each individual job is unjustly charged with a portion of the cost of some trivial item which was incurred for the benefit of other jobs, but such errors are compensated by an insufficient charge for other items in the distribution of the overhead. The average of all the items must be considered before classifying any one item as overhead. The errors in the distribution of the individual items of overhead, caused by apportioning the entire overhead in one amount, should always be compensating and the total charge to each job must be approximately correct.

Apportioning Direct Costs in the Office

It is safer and more accurate to treat an item as a direct cost than as an indirect cost. Direct charges do not necessarily have to originate in the reports emanating from the factory employees. If it is impracticable for the employees to report the measure of the charge for each job, it frequently happens that the total for a period may be correctly apportioned to the cost of the various jobs worked on from data in the office files. It is sometimes necessary to segregate first the cost of certain items which are impracticable for the factory employees to measure as used, and then to apportion it as a direct cost only to the jobs to which it applies. The classification of items as direct cost should be limited to such items as can be practicably handled as such, but in no event should the distribution of overhead be made incorrect by the inclusion of large items applying to a small portion of the jobs, to which the overhead is distributed, merely because the measure for the charge cannot be determined in a practicable way by the factory employees.

Recapitulation of Direct and Indirect Charges

Except for the demands necessary to meet local requirements, the distinction between direct and indirect charges in the three elements of cost, may be stated as follows:

MATERIAL. Direct material cost represents all the material that becomes a tangible part of the completed product.

Indirect material cost represents tools, factory supplies, and so forth, which do not become a component of the product. It is usually included in overhead.

LABOR. Direct labor cost represents the pay to employees for their services while actually converting the materials from the state in which they are received into the finished product.

Indirect labor cost represents the pay to employees who are not a direct factor in the production of the product, such as

foremen, truckers, and janitors. It is usually included in overhead.

Overhead. Overhead, an indirect cost, represents the expense of operating the production departments, including such items as supervision, power, depreciation, and items incident to the maintenance and operation of the factory.

Expenses of such a nature that they may in some instances be included in overhead should be treated as direct charges if they are incurred for the sole benefit of a particular article and their cost is of importance in relation to the total cost of the article, or if their inclusion in the overhead is vitally incorrect.

All overhead cannot be considered as a cost of manufacturing, except in periods of normal production. There is no denying that all overhead is an expense of doing business, but there is a limit to the amount of expenses that can be treated as costs of producing and passed on, with a "plus" for profit, to customers. When competition is keen, costs are analyzed and possible savings are sought. It is then that the bare producing costs are most needed, and the executives should not be misled by the inclusion of the expenses of idleness and subnormal production buried in the overhead figures. The overhead rates upon which the distribution is made should always be figured on the basis of normal production.

CHAPTER III

THE OPERATION OF A COST SYSTEM

Concrete Case Assumed—Character of Inventory

In order to understand the various methods of treating the elements of cost, further explained in the subsequent chapters, it is necessary first to have a perspective of the operation of a system illustrating the general principles of cost accounting with very simple factory operations. A cost system is merely a history, recorded in dollars and cents, of the operations of a factory. Consequently a complete study of the operations of a factory must be made before a system can be devised or a clear understanding gained from a description of the system adopted. Therefore, in order to present a view of a system in operation it is assumed that a survey of a factory is made and the following conditions are revealed.

It is found that the activities of the factory are confined to the manufacture and sale of a certain article, in various sizes, from only one kind of raw material, and that it requires five separate and distinct machining operations to convert it into the finished product. The different sizes of the product manufactured vary the amount of material required for each size and also the length of time necessary to complete each operation. The product is made in lots of one hundred, on orders issued by the production department for the various sizes, and when each order is completed the product is delivered to a completed-product storeroom, to remain there until shipped to customers. At the time of starting the system, no completed or semicompleted product is on hand and the entire inventory,

which is taken immediately prior to the operation of the system, consists of raw materials only. The production methods employed are found to have been well chosen. The raw material is received at one end of the building and in its sequence of operations is moved toward the other end of the building, where a storeroom for the finished product is located, adjacent to the shipping department.

System of General Accounts

In reading the following discussion of the system prescribed for the foregoing situation, the conditions and methods of operation should be constantly visualized. Before starting the operation of the system, the books of general account are arranged to segregate the manufacturing expenses in one group of accounts, separately from all other expenses of conducting the business. Controlling accounts are provided to record the movements of the material inventory and to reflect its cost value at all times. A storeroom is built for the deposit of all raw material and a stock-keeper is placed in charge with instructions to permit no material to be withdrawn except upon receipt of a requisition showing for what purpose it is to be used.

Production Orders

All production of the factory is to be authorized by a written order bearing a serial number. These orders are to be issued by the production manager to the foremen for the performance of all work. He is to designate on the order the quantity desired and to include but one kind or size of the product on one order. In other words, a separate order, with its distinctive number, is to be issued for the manufacture of each of the various sizes of the finished product.

Other Conditions Assumed

Requisitions are provided on which the foremen are to write their requests to the raw material stock-keeper for the issuance

of material, designating the order number on which it is to be used. The materials must be used only for the work designated by the order number on the requisition on which they are withdrawn. The cost of the material is to be entered later on the requisition.

Time tickets are provided to record the total time that each employee works, as well as the numbers of the various orders on which he works and the time consumed on each. The employee's pay for the time consumed on each order is to be entered on the time tickets in the office, and the total of these time tickets for a pay period must consequently agree with the total payroll.

Cost sheets are provided on which the cost of each individual job specified on the production orders is to be posted and summarized. A separate sheet will be used for each order.

In order to emphasize the comparison between the progress of the material during its conversion into its completed state and the parallel sequence of the entries recording the resultant costs, the actual short cuts which would be employed in the accumulation of the detail are temporarily ignored, and in order that the results may be more easily followed but one order is traced through the operations of the cost system. In reality the journal entries referred to in the following discussion would be made only for the monthly totals and not for each transaction.

Raw Materials Account

It will be remembered that just prior to the installation of the system, an inventory of the materials was taken and it was found that no processed materials were on hand. The total cost of the raw material inventory is charged to an account in the ledger called "Raw Materials." This account is also to be charged with the purchase price or cost of all raw materials received, and credited with the cost of materials removed from the stockroom, whether returned to the shipper or used for

production. The balance in the account after all entries are made will be the cost of the raw materials on hand in the stockroom.

Charging Work in Process for Materials

To start operations the production manager issues an order for the manufacture of 100 units of one style of the finished product. A cost sheet bearing the same number as the order issued by the production manager is headed with the description of the articles and the quantity to be made.

Upon receipt of the order the foreman writes his requisition for the material required on the order, showing its number, and sends it to the stock-keeper, who in turn issues the material and delivers the requisition to the cost department as his report of issued material. The cost is inserted on the requisition by the cost department, and it is posted to the cost sheet. The cost department then gives the bookkeeper a journal entry for his books, charging the Work in Process account and crediting Raw Materials with the cost of material shown on the requisition. At this point it will be observed that the material in the stockroom has been decreased by the amount requisitioned and transferred to the manufacturing department. The credit given the Raw Material account reduces the previously charged inventory figure to a balance equal to the cost of the material still remaining in the stockroom, and this could be proved by taking a new inventory.

The charge to the Work in Process account shows that materials of that value are at the moment on the operating floor ready for manufacture. This account in the ledger is to represent the cost of all work in process of manufacture and is further detailed by subsidiary cost sheets which show the cost of each order separately. It is to be charged with the cost of all materials used in the product, the wages paid for all direct labor, and the overhead charged to the cost sheets. It is credited

with the cost of all materials returned to the raw material stockroom, and with the cost of all product completed and delivered to the finished-product stockroom. The balance in the account will represent the inventory of the work in process of manufacture at cost, and will also agree with the total of the balances on the respective cost sheets.

Charging Work in Process for Labor

When the material is received by the foreman, he assigns it to the employees who are to perform the first operation on it, and it is subsequently delivered to other employees for the remaining operations.

The order number and the time that each employee consumes in performing his operation on the 100 pieces is reported by each on his time ticket, and in the cost department the corresponding pay to the employees is figured on the time tickets and posted to the cost sheet indicated by the order number, segregating the posting so that the total cost for each of the five operations may be acquired without re-summarizing.

The value of the raw material on the operating floor has now been increased by the cost of the work performed and the factory owes the employees for their wages. Accordingly the cost department gives the bookkeeper an entry charging the Work in Process account and crediting the Accrued Payroll account with the total wages due to all employees as shown by their time reports. The Work in Process account now contains the cost of the raw material in process of manufacture in the production departments, and the cost of the labor creating it in its present state.

The time tickets pour in until the final operation is completed on the last of the 100 articles, and they are all handled in a similar manner. When the order is finally completed, the cost sheet contains the cost of the raw material from which the finished product is made, and the amount of pay to all employees

who have actually performed the operations converting the material from its raw state.

Distribution of Overhead

It then becomes necessary to add the remaining item of cost, which is commonly called "overhead," and which embraces all the expenses of operating the factory incurred during the production, such as supervision, power, supplies, stock-keepers, and so forth. The proper portion of these expenses is added to the cost sheet to determine the total cost of the 100 articles, and the same amount is charged to the Work in Process account in the ledger and credited to an account called "Overhead Distributed," which is explained later.

The Work in Process account now includes the cost of 100 completed articles, and upon their delivery to the stockroom for finished product, the cost sheet is totaled and filed as completed. An entry is then given the bookkeeper charging Finished Product and crediting Work in Process with the total cost. There is now no work in process in the factory, no charges on uncompleted cost sheets, and the above entry balances the Work in Process account in the ledger, which represents the inventory of unfinished work.

Cost of Sales Account

When the product is sold, the cost is credited to the Finished Product account and charged to the Cost of Sales account. It is only on the profit and loss statement that the selling, delivery, and office expenses are taken into account, and they are usually treated as a deduction from the gross profit, leaving a balance which represents the net profit.

Volume of Detail in Practice

The operations of one order have been followed in the foregoing discussion. In reality many orders would be in operation

at the same time, but each would be handled in the same manner. The cost of each order would be recorded on separate cost sheets and the Work in Process account would show the total amount charged to all cost sheets. When the detail involved in a system as simple as the one just described is multiplied by provisions for all the numerous kinds of parts and assemblies made in some factories, the volume involved and the necessity of arranging time-saving methods will be appreciated. It is in such cases that the originality and ingenuity of the systematizer is taxed to the utmost, for the practical methods of accumulating the detail can be evolved only from study and thought concentrated on each particular case.

CHAPTER IV

FACTORY ORDERS

Issuance of Separate Production Orders

The system described in the preceding chapter is usually referred to as the "order method" of accumulating costs. Written orders, numbered consecutively, are issued for all work to be done in the factory and the costs are accumulated for each order. In reporting the costs the number is used to designate the order to which they should be charged, and to avoid the necessity of writing a long description.

In view of the fact that under this method the costs are obtained for each order, only one kind of article should be made on one order. Separate orders should be issued for the manufacture of each kind of article, so that the total charges to the cost sheet, divided by the quantity completed, will give the unit cost. To illustrate further, if an article requiring the manufacture and assembly of three parts is to be made, four production orders should be issued. Each quantity of the three parts should be manufactured on a separate order, and another order should be issued for the assembly of the three parts into the finished or completed product. Orders issued in this manner aid the foremen in keeping their records and avoid confusion in the production. They also simplify the cost records, for, as in the illustration cited, the cost of making each part and the cost of assembling are easily determined from the respective cost sheets without a redistribution of the charges, which would be necessary if the parts had been made and assembled on one order.

Amount of Order

The quantity to be made on any one order should be limited to such an amount as can be completed within a reasonable length of time. It is usually desirable to have the production order completed within a month so that the cost may be promptly figured for the total quantity ordered. If the quantity on one order is so large that it requires months to manufacture it, it is practically certain that the unit cost will be desired before completion of the order, and to determine the unit cost of the articles completed on an order which is not totally finished and on which the remaining production has reached various degrees of completion, it is necessary to make a detailed analysis of the cost charges. Such irregularities disturb the routine operation of the cost system and waste time. They may easily be avoided by issuing orders for smaller quantities. If it is desired to manufacture a quantity of an article which will require three months to complete, three orders may be issued, each for one-third of the quantity, with instructions in regard to the sequence in which they should be completed.

Overhead and Direct Cost Orders

In every cost system numbers are used, for convenience and to save time, as symbols to designate the work performed by an employee or the purpose for which materials are used. Consequently numbers are provided to indicate on reports everything done in a factory. When the order method is used to accumulate the costs, it requires two classes of orders—one for work on which overhead is applied as an element of cost, and the other for those items to which the addition of overhead is erroneous or non-essential. The first class may be called "overhead orders" and the second "direct cost orders." Both may be further subdivided to meet the requirements of each case.

The overhead orders are used for the manufacture of any article on which it is desired to include overhead in the cost.

Their main purpose is to order the manufacture of the product, but they may also be used for the manufacture of tools, machinery and so forth, or for repairs made by one department for another. The overhead and direct cost orders may both be carried under one controlling account. If this is done, the total of each may be easily obtained for financial statements by numbering each class with a separate series of numbers and taking subtotals of the costs against the unfilled orders in each when taking the trial balance at the close of each month to prove the correctness of the balances on the cost sheets with the controlling account. In some cases two or more controlling accounts may be carried, but in most instances, a separate series of numbers for each division or subdivision of orders, under one controlling account, will permit all data of any use to be obtained with much less work. Especially when the distinction between them is of minor importance, numerous controlling accounts often cause confusion and the loss of more time correcting the controls than is saved by the allocation of errors in the detail.

Direct cost orders are used for the performance of all work upon which it is not desired to add overhead to the cost. They are usually designated by a series of numbers distinct from those used for the overhead orders, but sometimes one series is used and the direct cost orders are designated by prefixing "D.C." to the order number. They are also called "internal orders," "expense orders," and so forth.

Standing Orders

Every foreman is granted authority to maintain his department in an efficient and cleanly manner, and in all cases where the cost will not exceed the limit placed by the superintendent, he is usually allowed to make repairs for his department without first consulting the superintendent. In order that he may have a number to symbolize such activities, standing orders, usually

numbered to agree with the account in the general ledger to which the costs are ultimately charged, are issued for such purposes. To illustrate, an order may be issued for cleaning and sweeping for an indefinite period and all employees performing such work should charge their time to its number. Another number may be used for general supplies withdrawn from stock for departmental use and should appear on all requisitions therefor. These standing orders are also direct cost orders, and the charges accumulated on each during the month should be transferred by journal entry to the ledger expense account.

Of course it should not, but as a matter of fact it frequently does, happen that the employees have idle time between jobs and the foreman utilizes that time by assigning them to such work as cleaning and keeping his department in good shape. Their time and wages should be charged against the proper standing order, and it is evident that it would be erroneous to add overhead to the cost of such work on the same basis as it would be applied to the actual manufacture of the product. Furthermore, when a department makes repairs to its own equipment, it may use its machinery and therefore its overhead may be correctly applied, but it is not essential, for the total cost of such repairs is charged back against the department and the overhead added merely increases the debits and credits to the account without affecting the balance. Therefore, the addition of overhead to the direct cost of these orders is either erroneous or unnecessary.

However, when repairs are made in one department on equipment belonging to another department, the work assumes the same characteristics as the manufacture of the product, and overhead should be added. The department for which the repairs were made should be charged for the use of the other department's facilities, and credit should be given to the department that made the repairs. Consequently an overhead order should be issued for repairs to be made in one department for

another, and a direct cost order may be issued when a department makes its own repairs.

Repairs authorized by standing orders should be limited. In the event that a foreman desires to make any repairs or alterations in his department, costing in excess of the limit specified in his blanket or standing order, he should be required to get special authority from the superintendent. The superintendent may then give him a direct cost order to which all such costs should be charged, and upon completion of the work the order should be closed and charged to the proper expense account.

Accounting Treatment of Both Types of Orders

The cost department should see that all special direct cost orders are immediately completed so that they may be charged to the expense accounts in due time and not carried as an asset in the work in process inventory. At the time when the books are closed for a fiscal period, all charges to uncompleted direct cost orders, or overhead orders issued for repairs and so forth, should be transferred by journal entry to the expense accounts, leaving no deferred expense charges in the inventory of work in process.

The necessity of carrying a work in process account for overhead orders and another for direct cost orders must be decided from the facts in each case. When the volume of detail is large it is advisable to carry two or more controlling accounts, but in the average factory one controlling account is sufficient if a separate series of numbers is used for each class of orders and if the charges to expenses are promptly transferred from the cost sheets.

Subdivision of Overhead and Direct Cost Orders

Briefly summarized, the two classes of orders may be subdivided as follows:

Overhead Orders

1. Production Orders
   - (a) For the manufacture of parts.
   - (b) For the manufacture of finished and sub-assemblies.
   - (c) For repairs to factory stock.
   - (d) For repairs made gratuitously to product previously sold to customers.
2. Repair Orders
   For repairs to be charged to customers.
3. Factory Orders
   - (a) For making equipment and plant items, including betterments, improvements, and so forth.
   - (b) For repairing general equipment.
   - (c) For repairing departmental equipment when repairs are made in one department for another.

Direct Cost Orders

1. Standing Orders
   - (a) For cleaning and sweeping.
   - (b) For stock-keeping and so forth.
   - (c) For trucking stock.
   - (d) For minor repairs to departmental equipment.
   - (e) For petty productive operations to be prorated to costs through overhead.

   This classification may be further subdivided to meet local requirements.
2. Special Orders
   - (a) For special repairs to departmental equipment when made by the department in which the equipment is located.
   - (b) For constructing improvements not requiring the use of the factory, such as buildings, roads, and so forth.

Cost System and Production Methods

From the foregoing comments it will be seen that a well-planned system of production is a valuable aid in the accumulation of costs by the order method. However, the cost system should always be of secondary consideration in matters per-

taining to production, and as the requirements for efficiency in the methods of production are similar, it is never necessary to suggest a change in the methods for the sole benefit of the cost system. If a suggested change will not increase the production or decrease the cost, it would be ridiculous to ask for it merely to make the cost department's work easier; but if it does have beneficial effects, this is the reason for the change, and the cost system does not enter into the argument. The well-planned system of production always permits the most simplicity in the cost methods.

The term "production methods" is used to refer only to the ordering of the product, the arrangement of the factory, the routing of the work, and not to the design and specifications of the product, nor to the tools and machinery used. The methods are purely a local problem, and must originate from hard study of the plant facilities and common sense. Devising the methods of production is perhaps a harder problem than that of devising a cost system, but because of the important effect which the production methods have upon the cost system, the cost accountant should be prepared to offer constructive assistance.

Order Method Used in Every Cost System

Regardless of what method is used to determine the costs of the product manufactured, the order method is used to some extent in every cost system. If the process or any other method is used, it is necessary to issue orders, but the production orders would be ignored for cost purposes and symbol numbers would be provided in their place to designate the processes or operations performed on the product, and to these numbers the employees would charge their time. Repair orders, factory orders, standing orders, and special orders would be issued in all systems, and the costs would be charged to the order number.

CHAPTER V

METHODS OF ACCUMULATING COSTS

Three General Methods

The various systems of securing and segregating cost data are practically based upon three methods. Each of the three methods is varied to some extent when applied to a specific case. As nothing would be gained from a tiresome exposition of all the possible deviations from the basic methods in local applications, the variations have been ignored in this chapter. The basic methods underlying all cost systems are discussed and classified as follows:

1. Order or job method
2. Process method
3. Operating unit method

Order or Job Method

The theory of the order or job method has been already explained in Chapter III, but it may be briefly described as follows:

Orders classified according to their purpose are issued for all work to be done in the factory. Each class or subdivision of the orders is usually numbered in series, but occasionally the production orders are numbered to correspond with the part number of the article ordered, and a lot number is then affixed to designate the number of orders issued for each particular part. Under the latter method, order No. 262-5 would signify that it is the fifth quantity of part No. 262 to be ordered. All records are then filed according to the part numbers, and any

data may be quickly found without reference to a cross-index between the part and order numbers.

The costs are segregated for each order, and consequently separate orders should be issued for the manufacture of each kind of article for which the cost is desired. Every expenditure for the productive operation of a factory, including materials, labor, and overhead, is eventually distributed to the respective orders as an element of cost of the product manufactured. The materials used and the time of the employees performing the work on an order are reported to the cost department, where the cost is figured and charged to the order. The overhead is then added as the final element of the cost.

Process Method

Under the process method all costs, including material, labor, and overhead, are segregated according to certain operations in the process of manufacturing the product. This method is used chiefly for the distribution of a combination of cost elements which cannot be definitely charged to an order, or finished article, until after the operation or process is completed and the measure of the charge can be obtained from the finished work. The system used for a foundry to ascertain the cost of castings illustrates this method very clearly. When the materials are withdrawn from stock to be melted in a cupola, it is impossible to determine the amount of each that will eventually become part of the different kinds of castings that may be poured from the one batch of metal. Neither can the exact quantity or weight of the various castings be anticipated. Therefore, the materials are charged against the cupola together with the wages paid its tenders and all expenses in connection therewith, including fuel, repairs, depreciation, and so forth. The total of the charges against the cupola is then divided by the total number of pounds of castings made, to arrive at the unit cost per pound, and the cost of each kind of

casting is found by multiplying the unit cost by its weight. The costs are first accumulated for the process and are then distributed to the product.

If the castings are machined in the same factory, the order method may be used to accumulate the cost of the work subsequently performed. Factory, standing, and special orders would also be used and the costs pertaining thereto would be charged to the order numbers.

Operating Unit Method

It frequently happens that the product of a factory is simple in construction and consists of four or five sizes of the same article, that many of the operations are similar on all sizes, and that their manufacture is continuous. In such cases simplicity will be gained by the use of the operating unit method. Instead of accumulating the cost of each production order, the operation cost is found. Every operation on the product is given a number and the employees report the time that they work on each operation. They may be working on four or five production orders during a day but performing the same operation on each, and therefore their total time for the day would be charged to the one operation number. This saves the employee from making a large distribution of his time and reduces the computations in the cost department.

The unit cost of performing each operation is found by dividing the total charges to the operation by the quantity completed in that operation. The materials withdrawn from the stockroom are requisitioned and charged to the material cost sheets for the respective kinds of finished product. The unit cost of material is found by dividing the total cost of the materials withdrawn by the quantity started in process. The total number of each kind of article completed is reported by the production department or finished stock keeper. The operation and material cost sheets are credited with the cost of the

product totally completed, and summary cost sheets for each kind of product are charged with the amount applicable thereto. Overhead is then added to the summary cost sheets to determine the total cost of manufacturing the article.

CHAPTER VI

MATERIAL COSTS

False Analogy Drawn Between Methods of Guarding Cash and Materials

The careful methods of guarding cash are often cited as an argument in favor of adopting similar methods to guard material which represents a conversion of cash and is expressed in terms of cash among the assets listed on a financial statement. A five-cent expenditure from a petty cash box is recorded exactly. The petty cash fund is balanced every night and the total cash remaining in the box, amounting to perhaps $25, is carefully deposited in a safe for the night. On the other hand, material costing $1,000 in cash is allowed to lie around in any convenient place in a factory and the significance of its cash value is lost.

As a matter of fact the analogy is a poor one. Money is in a form everyone can use and employers are derelict in their duty to those to whom they entrust it if temptation is not removed, by proper accounting and safeguards, from those who are weak or in adversity. Materials are of value for only definite and limited uses, and the care with which they should be guarded from theft depends upon the extent of their universal use. In other words, such material as silver, platinum, gold, and so forth, should be accounted for with all the precautions employed for money, while pig iron does not need, as a precaution against theft, to have a system of daily balance. The form of the material and its possibilities for conversion or use by those handling it must be considered as well as its value.

Advantages of Accounting System for Materials

The best argument favorable to the adoption of a system of accounting for material lies in the production benefits which naturally accrue to the factory in which such a system is installed. Imagine the confusion in a factory which has no stockroom and no definite system for the location and handling of materials. Under such conditions related materials are not segregated and can be found in various locations scattered over the entire factory. Often materials are unearthed which have not been known to be on hand and consequently purchases are made far beyond the ordinary requirements. Every high-priced machinist is perhaps his own stock-chaser and spends in the aggregate a surprising number of hours wandering about to locate the materials he requires.

With the installation of a system accounting for material, a stockroom is demanded and the floor of the production department is cleared of all raw material except that withdrawn by requisitions for immediate use in production. The stock is arranged in bins, racks, and so forth, and upon a moment's notice the stock-keeper in charge can locate any material and can tell the quantity on hand. The operators are relieved from chasing stock and are permitted to give their entire time to production, which is accordingly increased while the costs are correspondingly decreased. They are not hindered by an untidy floor and the very appearance of the factory in the new order of things tends to create more efficiency. A statement comparing the old and new methods will reveal, so far as known figures are concerned, an increase in the amount of overhead under the new method on account of the employment of stock-chasers and stock-keepers. However, this is more than offset by the increase in production and the decrease in labor costs brought about by the extra time allowed the operators for productive purposes, and the saving effected by discontinuing the employment of skilled labor for manual purposes. Under the

old method much of the loss is buried in other figures. The new method requires thought before action, and demands a systematic planning of the work. Without considering the interest wasted on capital invested in excessive stocks of some materials and the expensive production losses due to lack of other materials under the old method, a conservative estimate of the saving created by the new method would be as follows:

In general, one stock-keeper and one stock-chaser or trucker can serve 100 operators and thereby prevent a loss of at least ½ hour out of every 8 hours, which otherwise is spent by the operators finding and trucking their own material. In other words, the addition of two men to the force, or an increase of 2 per cent, increases the production 6⅔ per cent and effects a saving in labor and overhead costs equal to 6¼ per cent. If the labor and overhead cost is 60 per cent of the total cost, the saving approximates 3¾ per cent of the total cost, and if the net profit is equal to 10 per cent of the total cost, this saving increases the amount of the net profit approximately 37 per cent. As a statement of percentages it may be of little interest, but when realized in cash and distributed as a dividend, such an increase is very welcome.

Materials as Direct and Indirect Charges

In determining the cost of manufacturing various articles, materials may be accounted for as either a direct or an indirect charge. In allocating any of the elements of cost to the product, jobs, and so forth, the accuracy of a direct charge makes it preferable to an approximation resulting from an indirect charge. The character of the materials does not necessarily indicate the treatment to be accorded them. Tools of general use and having a short life would be charged to expense and applied to the costs through the distribution of overhead; but tools, whether purchased or made, which are used expressly for the execution of a single order, would be charged as a direct

item of cost to the order. In a contract shop performing work according to its customers' specifications, tools are frequently an important item of the costs and are usually entered on the cost sheet as a direct charge.

If tools are especially made for a specific job, a subproduction order would be issued for their manufacture and upon its completion the total costs would be transferred to the main production order for the customer's work. In this manner the detailed cost charges for the manufacture of the tools would not be confused with the other costs.

Materials which become component parts of the finished article or are of a direct benefit in its manufacture are treated as a direct material cost if it is practicable so to account for them. Otherwise they are treated as an indirect cost and allocated to the various articles manufactured, through the distribution of the overhead. For instance, in the operation of the ordinary painting department of a factory it would be practically impossible to determine the amount, or cost, of paint used on each article, particularly when the same paint is used on various kinds of articles. There is no doubt that the paint is materially evidenced in the finished article and has actually become a component thereof, but in view of the impracticability of treating it as such, it is considered an item of indirect material and applied to the cost through the overhead. If the overhead is distributed on the basis of the productive hours, it is fairly safe to assume that the longer a man paints the greater will be the cost of the paint used.

Indirect materials, in addition to including direct materials which cannot be accounted for in a practical manner as used, consist of such items as perishable tools and all sorts of factory supplies. They may be carried in the same storeroom with direct materials and requisitioned by the factory when required. When withdrawn from stock on requisitions, they are charged to the standing orders under which they are classified and

accumulated until the close of a month when they are transferred in total to the general ledger.

In the treatment of materials and all other items of cost there are certain industries that require special consideration, such as a foundry, for illustration. These special cases have been ignored to avoid confusion to the reader in grasping the general principles of costs as applied in the most common forms which, if mastered, are easily adapted to any industry.

Installation of Cost System

Preparatory to installing a cost system, all materials on hand should be systematically arranged to provide for the new requirements. An inventory must be taken and summarized according to the controls to be established. The unused materials on the operating floor should be removed to the storerooms, and the materials used on work partially completed should remain on the floor and be listed, with order or symbol number, as the inventory of work in process of manufacture. The work in process should be priced at the cost of the material, plus the cost of the labor and overhead for the operations completed. It is posted in detail to the cost sheets and the total is posted to the controlling account, called "Work in Process," in the general ledger. A separate inventory should be taken of the materials in each of the storerooms, from which the detail should be posted to the stock records and the totals to the ledger controlling accounts. The raw materials are usually valued at the purchase or invoice price. The finished parts and finished product are valued at the cost of the material used, plus the cost of the labor and overhead completing them.

It is expected that stockrooms will be provided for the finished product and parts, so that they may be cleared from the manufacturing departments when completed and stored in a systematic manner. When manufactured parts are to be

used in assembling, they should be requisitioned in the same manner as raw materials.

Stockrooms

The inventory accounts usually represent the various stockrooms in a factory. Frequently a stockroom will contain more than one class of materials and if desired for some practical purpose its control may be subdivided to provide for each class. The location of the storerooms is chosen for the convenience of the production departments served by the material contained therein. This may possibly result in the creation of three storerooms—one, mainly containing raw material, would be located adjacent to the machining department; another, containing mainly finished parts, would be located adjacent to the assembly department; and still another, containing the completed product, would be located adjacent to the shipping department. In each of the three storerooms more than one class of material may be found. To illustrate, in the storeroom broadly defined as "raw material stores" there may be raw material, perishable tools, and various other supplies purchased in quantities in excess of immediate requirements; and the finished parts storeroom may contain finished parts and various perishable tools and supplies used in the assembly department.

Raw material is usually carried at purchase cost in the inventory and throughout the transfers recording its use, but freight may be added if it amounts to a consequential figure per unit. If practicable and productive of more accurate results in the final cost figures, a handling charge should also be added to the purchase price to cover the cost of placing the materials in the stockroom. This is seldom required or done, as it entails an endless amount of detail in revising unit prices, or in applying it as a separate burden on the cost sheets.

To maintain perpetual inventory records, it is necessary to adhere to the rules and see that absolutely no material leaves

the stockrooms except upon receipt of a requisition signed by the foreman or clerk of the department where the material is to be used. The receipt of material in the stockrooms may be easily checked in the offices from invoices and production reports, but the stock-keepers must be relied upon for the correctness of the reports of materials issued. As in all other matters pertaining to cost accounting, perpetual inventory records are useless to attempt without the honest co-operation of the factory employees.

Forms Used—Stock Record

Perpetuating the inventory records by accounting for all materials may be illustrated by a description of the forms on which there may be recorded the various transactions incident to the acquisition and disposition of the materials. The forms described in the following are given merely as illustrations and not as a prescribed standard. It will be noticed from the descriptions that the volume of detail requires a very systematic method of filing and a routine that may be followed without loss of time. If properly arranged, the amount of detail which can be handled by one cost clerk is almost unbelievable to the layman. He may even doubt the possibility of getting his costs economically, but if he will inspect a system operating successfully, he will find his fears to be groundless.

A complete stock record of each item of material should be kept on individual stock record cards. The upper part of a card should provide for a full description of the material, its location, and the minimum quantity to be carried in stock. The symbol or part number should also be shown for the finished parts and product. The cards should be filed in the most logical manner which will permit immediate reference to any particular card. The body of the card should provide columns in which to enter the date, reference to the form from which the posting is made, unit cost of quantity received, the average unit cost

of quantity on hand, the quantities received, and issued, and the balance or inventory on hand. The total cost values of the postings to the stock record may also be shown, but as a rule nothing is gained by doing so.

Tests may be made to verify the balances on the stock records by occasionally taking an inventory of a few items and comparing the actual count with the stock records. A complete inventory should be taken and the records adjusted thereto at least once a year. In order to avoid a repetition of errors and to correct any possible misunderstanding among the employees, any important discrepancies that may be found in the stock records when the physical inventories are taken should be thoroughly investigated to trace and eliminate the cause before any adjustments are made.

A separate stock record card is used for each kind of article or material, and the unit cost and quantity on hand at the time of taking the inventory is posted to the card. The subsequent entries record merely the receipt or issuance of the materials and the resulting balance on hand. The receipts may be purchases, finished articles or components thereof made in the factory, or materials returned by the manufacturing departments as unused on account of withdrawing an amount in excess of the quantity required. The materials withdrawn or issued may be returned to the shipper, used for manufacturing purposes, sold to customers, or scrapped.

When purchased materials are received they are reported by the receiving clerk on a receiving slip. The receipt of manufactured articles and the return of unused materials are reported on transfer slips (see page 40).

Materials returned to the shipper are reported on a return purchase slip (see page 39). Requisitions (see page 40) are issued for materials used for manufacturing purposes or scrapped. The withdrawal of material sold to customers is reported on shipping orders (see page 42).

Receiving Slip

Each shipment received by the factory should be recorded on a receiving slip made in triplicate. The upper part of the form should provide for the name of the shipper and the data required to identify the goods with the shipper's invoice. The body of the form should provide for listing a detailed description of the items received and their unit cost. The triplicate copy should remain with the receiving clerk for his record and the original and duplicate should be delivered with the goods to the stock-keeper who will receipt the original and send both copies to the office. The postings to the stock record cards are made from the original after the unit costs have been entered thereon, and the duplicate copy should be checked and filed with the invoice. The invoices are charged to the inventory account representing the stockroom to which the material was delivered.

Return Purchase Slip

When purchased material is to be returned to the shipper, full instructions are given to the shipping department upon a return purchase slip which should be made in quadruplicate. The original should be priced and sent to the accounting department to be billed. The remaining copies are delivered to the shipping clerk. The duplicate and triplicate copies are used as a requisition to withdraw the material. The stock-keeper will retain the triplicate for his receipt and will send the duplicate, properly signed, to the office as a report of material issued. The shipping clerk will notify the office in regard to the shipping details on the quadruplicate. If purchased materials are carried in the inventory at a cost which includes freight and handling charges, the duplicate return purchase slip should be cost-priced from the stock records when posted, and the monthly total should be credited to the inventory accounts and charged to the Return Purchase account. Then, when the amount billed to the shipper is credited to the Return Purchase account, the

balance, representing other costs absorbed, such as freight and so forth, should be closed by journal entry to the account provided for such unabsorbed costs.

Requisitions

Requisitions should be designed to provide for a full description of the material to be withdrawn and also for the insertion of the unit and total costs, and the order number on which the material is to be used. The original and duplicate copy should be sent to the stockroom when the material is withdrawn. The duplicate copy will remain in the stockroom as the store-keeper's receipt and the original should be sent to the office as a report of material issued. It will be cost-priced at the time the stock record cards are credited, and posted to the cost sheet for the work for which the material was withdrawn. In many cases requisitions printed with the requirements for the various assemblies made can be used to good advantage and thereby save a great deal of time. Where the material requirements are specified on the production orders by the production department it can be arranged to type carbon copies of the requirements on requisition forms and save further writing.

After the detailed postings are made, the requisitions are filed away until the end of the month, when the total for each stockroom for the month must be obtained and credited to the general ledger inventory accounts, charging the Work in Process account, and other accounts indicated on the requisitions.

Transfer Slips

During the production of an order it frequently happens that more material has been withdrawn from the stockroom than is needed to complete the order, and such left-over material may be disposed of by returning it to the stockroom or transferring it to another production order. A transfer slip may be

used to record such transactions. This form should provide for a full description of the material and its cost. It should be so arranged at the top as to set forth prominently to what order and department, or stockroom, the material was delivered and from what order and department, or stockroom, it was sent.

If the material is returned to the stockroom, the cost sheet for the order to which it had been charged should be credited and the stock records charged. The total of such entries for the month is charged in the general ledger to the inventory accounts for the stockrooms and credited to the Work in Process account.

If left-over material is transferred and charged to another order, credit should be given to the order from which it was taken, but no journal entry in the general ledger would be required, as such transfers do not disturb the total of the inventory of work in process.

When transfer slips are used to record the delivery of articles manufactured in the factory on orders totally or partially completed, they are priced at the cost computed on the cost sheet. The stock records are charged and the cost sheets are credited. The total for the month is charged in the general ledger to the inventory accounts for the stockrooms and credited to the Work in Process account.

In the manufacture of certain articles the scrap is worth as much as the completed article. When the borings and scrap recovered from the production of an order are of enough importance to justify giving credit to the cost sheets, the transfer slips are used for this purpose and to charge the stock records. They should be priced at approximately the market price for the scrap. The total of such transfers for the month should be credited to the Work in Process account and charged to the inventory account for the stockroom to which the scrap was delivered. The sale of scrap should not be included with other sales but should be credited to a scrap account, against

which a charge may be made for the amount at which the scrap had been carried in the inventory.

Occasionally it is desired to transfer materials from one stockroom to another, and the transfer slip is then used to credit and charge the stock records for the respective rooms. The total of such slips for the month is entered in the general ledger to the debit of the account for the stockroom receiving the materials and to the credit of the account for the stockroom transferring the materials.

Shipping Orders

Shipping orders are issued to the shipping clerk with full instructions for shipments to customers. They may be made in quadruplicate, and should provide columns in which to enter the cost and selling prices. The fourth copy would remain in the office as a check on the shipping and billing departments. The remaining three copies would be sent to the shipping clerk, who would give the duplicate and triplicate to the stock-keeper as a requisition when he withdraws the articles to be shipped. The original copy would be used by the shipping clerk to notify the office of the shipment, and the invoice to the customer would be made therefrom. The total of the invoices made during the month is charged in the general ledger to the Accounts Receivable and credited to the Sales accounts. The costs are inserted on the duplicate copy of the shipping order when the stock records are credited, and the total for the month is charged in the general ledger to the Cost of Sales account and credited to the inventory account for the stockroom.

CHAPTER VII

LABOR COSTS

Recording Labor Costs

Labor cost, like material cost, should be treated as a direct charge against the product manufactured only to such an extent as its direct allocation is practicable. Labor used in performing operations actually contributing to the conversion of a job into its completed state is called "direct or productive labor." When it is not directly creative, it is called "indirect or nonproductive labor." For cost purposes, labor that actually operates on the product or assists in its manufacture, which can be practically accounted for and charged directly to it, is treated as a direct cost. All other labor, used in maintaining the plant and of general assistance in the manufacture of the product, which cannot practicably be distributed to the product by the individual employee, is treated as an indirect cost.

All factory employees, with the exception of supervisors and other salaried employees not directly producing, must account for their entire time. Separate payrolls may be used for the superintendents and foremen, which may be summarized monthly and distributed to the expense accounts provided in the general ledger.

An Accrued Payroll account should be opened in the general ledger, and charged with all money paid for wages and salaries. The payrolls should be complete and contain a record of the earnings of every employee even though employed but a short time. The distribution of the factory payrolls to the classified accounts in the general ledger is made from the daily time

tickets and proved with the payrolls. When the entry is made the total is credited to the Accrued Payroll account and the balance in the account then represents the amount owing for wages unpaid at that date.

Use of Numbers to Indicate Classes of Indirect Labor

The time consumed in recording the various operations or classes of work performed by an employee may be reduced to a minimum by the use of symbol numbers. The production orders and operations are always numbered, and another series of numbers should also be used to designate the various classes of indirect labor performed in the factory. In order not to confuse the factory employees with accounting distinctions, all factory activities should be referred to as "orders" and a set of standing orders should be issued to provide for the charges to be made by them to expense accounts. The numbers should indicate the distinction between production and expense charges. Among the standing orders one would be issued for trucking, and the men employed solely for trucking material would charge their time for the entire day to its number, while other men who may be called upon to aid temporarily in this work would also charge to its number the number of hours so employed during the day. Thus in distributing their time the factory employees are not required to make any distinction between direct and indirect labor. They are merely instructed to record the time worked on an order and the number designating it.

Time Tickets

Accurate labor costs require the entire time of the factory employees to be accounted for and correctly apportioned to the orders or operations on which they work. The short-cuts that may be used and the manner of summarizing the charges are local problems and, because of their simplicity, require no discussion.

The time tickets should provide spaces for the insertion of the date, the employee's name, the department, the order and operation numbers, the quantity completed, the time consumed, the rate and amount of pay, and the foreman's O.K. The form may be so arranged that the distribution of the employee's time for the entire day may be recorded on one ticket, or it may be so devised that only the time consumed on one order is recorded on one ticket. When separate tickets are used for each job, they may be sorted and only the summarized totals posted to the cost sheets, thereby saving a considerable amount of work.

The total time charged by the employees on the time tickets should be checked and verified daily with the clock cards. The rate should be entered and the total pay for each job extended. The tickets from each department should be proved as a unit and summarized for the monthly total of direct and indirect labor, and if the overhead is to be prorated on the hourly basis, the productive hours should also be totaled monthly. The tickets may be posted daily to the cost sheets, or if the individual order tickets are used, they may be filed according to order number until the close of the month, when an adding machine summary may be made and the total for each order posted. The grand total of the summaries must be proved with the payroll, making allowance for discrepancies resulting from dropping fractional cents in the extensions on the time tickets.

If wages are paid on the piece-work basis, the tickets are handled in the same manner as for an hourly basis. Two forms should then be used—one for piece work, and one for time work. The difference between them is sometimes emphasized by the use of a distinct color for each. The same information is desired on each, but the method of figuring the employee's pay differs.

In some cases it may be found advantageous not to extend the employees' pay on the daily time tickets, but merely to post the employees' number and the hours worked on each order

to the cost sheets. Upon completion of an order, the time of each employee charged to the cost sheet would be totaled and multiplied by his hourly rate to determine the cost of his labor.

The possible variations in the methods of handling detail emphasize the importance of not being confined to any one system. In finding labor costs the forms and system used should be inspired from the nature of the product and all of the processes of the factory. The theory is very simple, but under some conditions it is extremely difficult to put into operation. Each of the three general methods of accumulating costs, described in Chapter V, requires a different treatment of labor costs, as is illustrated in the following.

Labor Costs Under Order or Job Method

If a factory makes various articles of different specifications, it will probably be most advantageous to accumulate the cost for each production order, issuing a separate order for the manufacture of such a quantity of each article as can be made within a reasonable length of time. If one order is issued for the manufacture of two distinct articles, it would result in unnecessary work separating the charges against it in order to determine the cost of each article. Production orders should also be issued for each minor or subassembly made for production economy. When costs are accumulated for orders, the orders should conform to the cost and production requirements, and therefore instructions should not be issued for the manufacture of more than one kind of part or assembly of parts on one order. By the proper issuance of production orders, the cost records are simplified and reveal without extra effort the cost of each part, each minor assembly, each main assembly, and the completed article. The cost charges to each production order should be for distinctive units and the need of further distribution is thus eliminated.

The activities of the factory employees may be simplified

and specialized by a systematic planning of the work directed by the production orders, and the task of reporting their time will consequently be insignificant. Each employee accounts for his entire time daily and reports the time he worked on each order, the operation which he performed, and the quantity completed in that operation.

Labor Costs Under Process Method

Under the process method the costs are accumulated for chosen operations or processes. This method is best adapted to accumulate the cost of articles similar to castings, where it is impracticable for the factory employees to ascertain the amount of material and labor to charge to each order or article simultaneously worked on. The costs are itemized for each process on a monthly statement showing in detail the materials and labor used, and overhead expenses of operating. The monthly total is then reduced to a unit for the entire production, which can be applied to the measure of the individual articles made in order to determine the cost of each.

Orders are issued authorizing the factory employees to charge to the respective process order numbers the materials and labor used in the various processes required for the production orders. In the event that each of the productive employees is employed and exclusively used for a single process or operation, the distribution of labor costs to the respective processes can be made from the payrolls. When the time of the employees is divided among different classes of work, they are required to make a daily time report, stating the time to be charged to each order or process number. The quantity of the product worked on is not shown on the time tickets of each employee but is reported on a production record for each process.

A variation of this method, for labor and overhead only, is used in conjunction with the order method when the costs

are figured on the basis of the machine operating hours. Each machine or class of similar machines is given a number and the employees charge their time to the number of the machine on which they work. The overhead is added to the labor cost of operating the machine for a month, and the total is divided by the number of hours which the machine operated, in order to determine its operating cost per hour, including labor and overhead. The employees make a daily report of the time the machine is used on each production order, and when extended at the hourly operating rate, it is posted to the cost sheets for the production orders. The materials used are also charged to the production orders and the cost of each order is thus accumulated.

Labor Costs Under Operating Unit Method

The operating unit method requires the materials used to be charged against the respective kinds of product made, and the labor against the operations. It is especially adapted to a factory making articles whose cost varies only on account of materials. Orders are issued for each of the operations to be performed, and are designated by number. The time of the employees is charged to the operation order numbers on which they work, and except for production purposes, no attention is given to the production order numbers. The employees report daily the number of hours consumed in performing each of the various operations, designating the operation by its number, and also the total quantity completed. The wages are extended on the time tickets and posted to operation cost sheets. The cost per article of performing an operation is found by dividing the total quantity completed in that operation into the total labor charges to the operation cost sheet.

Cost summaries are prepared for each kind of article completed during the month, on which are listed all the materials and operations required. The cost of the respective materials

and operations required for the articles fully completed is credited to the material and operation cost sheets and entered on the cost summary. The total of the balances then remaining on the material and operation cost sheets represents, with the overhead applicable thereto, the inventory of work in process. The overhead for the articles fully completed is entered on the cost summaries.

CHAPTER VIII

OVERHEAD OR BURDEN COSTS

Determining Amount of Overhead

All of the expenses of doing business are frequently referred to as "overhead," but in a manufacturing business the expenses are divided into two main groups and only the expenses for the operation of the factory are classified as overhead. The office, administrative, selling, and delivery expenses are excluded from the overhead group and are referred to as "commercial expenses."

To determine the amount of overhead applicable to the individual items made in a factory it is necessary:

1. To classify all of the expenses of the business.
2. To eliminate the commercial expense and adopt appropriate accounts.
3. To define the bounds of the factory departments established to meet the cost accounting requirements.
4. To adopt the manufacturing or overhead expense accounts.
5. To classify the overhead accounts as fixed, or producing expenses.
6. To determine the normal operating capacity of the factory.
7. To prepare the overhead statement, allocating the expenses to the producing departments.

Classification of Expenses

All of the expenses of a business should be carefully studied and classified before preparing a chart or list of accounts. The account names should be thoughtfully chosen and should be

descriptive of the charges classified thereunder. The accounts should not be so numerous that the distribution of invoices will result in needless complications; neither should they be so few that they do not give an intelligent analysis of the expenses. There is nothing more objectionable to those who are financially interested in an industry than to find a large amount shown upon a statement under the heading of "Miscellaneous Expenses." Broad general accounts in which all sorts of unrelated items may be charged should be avoided. The accounts finally adopted should set forth a complete analysis of the expenses and thereby eliminate all large amounts from a miscellaneous or general account.

If the expense accounts are not well chosen, continual requests will be made by the executives for analyses of the charges to certain of the accounts, entailing an unnecessary search of the files and causing a duplication of work that could have been avoided. When making the original entry on the books, all data is at hand to indicate the proper classification of every item. All items must be summarized and posted, and it makes practically no difference in time if they are posted to four accounts or to twenty accounts. With a broad selection of accounts, the books will present a satisfactory analysis of the expenses and the bookkeeper will be saved from re-summarizing his work.

As it is one of the objects of every cost system to summarize the results into monthly financial and operating statements, it is essential that all expenses should be charged to the proper accounts in the month benefited. In the event that certain expenses are paid in advance they should be carried as an asset and charged off proportionately over the period which they cover. It may also become necessary to accrue other items which may not be finally determined in amount nor payable until a subsequent date. The deferring and accruing of items should not be carried to an impracticable extent for there

will be found petty items in almost every expense account which affect periods other than the month in which they were entered. Unless the amount is large enough to have an important bearing upon the overhead totals and rates, there is no necessity of apportioning it. Petty accrued items will balance the petty deferred items.

Commercial Expense Accounts

After an article is manufactured it may remain in the possession of the manufacturer for some time before it is sold and delivered to a customer. Therefore, in acquiring its cost there must necessarily be a break or division in the expenses of a manufacturing business so that only such expenses as are necessary to produce and deliver the article to the finished parts stockroom will be included in the cost figures at which it will be inventoried while remaining in the possession of the manufacturer.

There are two distinct activities in a manufacturing business: (1) the manufacture of the product; and (2) the sale of the product. Consequently in order to obtain the cost of each activity separate groups of expense accounts must be provided in which the manufacturing expenses may be accumulated separately from the marketing expenses.

Only the expenses incurred for the operation of the manufacturing departments are classified as overhead and included in the manufacturing costs. The office, administrative, selling, and delivery expenses have no purpose in the actual creation of the product but are for the selling and marketing activities, and as a group they are usually referred to as the "commercial expenses."

The factory costs include all items incident to the manufacture of an article until it is delivered in its completed state to the finished stockroom. A manufacturing business encounters the same problems in selling its own product as are

found in a jobbing business. The factory costs represent the purchase price to the sales organization of the article manufactured, and the activities of the sales department of a factory are accounted for in the same manner as those of a jobbing business.

In factories making several articles it is often desired to compare the cost of producing one of the articles with the purchase price of the same article made by other manufacturers, so that the advisability of confining the manufacturing operations to a smaller variety of articles may be considered. It also frequently happens that certain parts of a special nature can be purchased much cheaper from other factories. In all such cases the manufacturer desires to compare his own factory costs with the prices at which he can buy the same article from other factories, and if commercial expenses were included in his factory cost the comparison would be of no value. His object in seeking prices from others is merely to ascertain if he can buy more cheaply than he can manufacture.

For the purpose of establishing selling prices commercial expenses may be reduced to a unit cost per article and then added to the factory cost, but in no case should this be done on the cost records which are used for inventory values. The sales department may sell the product before it is manufactured, but for operating reasons it may manufacture the product in advance of the delivery date and carry it in stock until shipped to the customers. Ordinarily, due perhaps to the possibility of receiving cancellations of orders, it is customary to charge the commercial expenses against the profit made in the period in which the expenses were incurred. There are of course exceptional cases, such as concerns manufacturing seasonal articles where practically the entire output is sold months in advance of delivery dates, and where it would be misleading not to carry the selling expenses as a deferred charge or asset until the sales were consummated by delivery and entered on the books, as

otherwise a fictitious loss would be shown in the order-taking period, which would finally be adjusted by an overstated profit in the period of deliveries.

Subdivisions of the commercial expenses should be determined by the requirements of each particular case and the advisability of allocating the expenses to the various individuals incurring or responsible for them. In a small organization it may be desirable to segregate them in one group of accounts without providing separate divisions for office, general administrative, selling, and delivery expenses. Larger organizations require a further subdivision, but in each instance the requirements will be suggested by the construction and operation of the organization. Frequently the commercial expenses are allocated to the various kinds or models of the product sold, but such distributions are also governed by local conditions.

Departmentalizing a Factory for Cost Purposes

An efficiently operated factory will be found in most cases to be properly departmentalized for cost purposes. A room or a floor does not necessarily define a department nor can it be concluded that the jurisdiction of a foreman always extends only over one department in the sense in which the term "department" is used in connection with overhead. A department may not be confined to one room and one room may contain more than one department. The fundamental object in creating departments for cost accounting purposes is to establish the distinction between different classes of work or operations on which the overhead costs vary in amount per distributing unit, or where the methods used to prorate the overhead costs cannot be uniform, and also to allocate the expenses in such a manner as to hold to accountability those responsible for incurring them. The judgment of the systematizer must be relied upon to determine the bounds of the factory departments for cost purposes. There is no rule.

A small factory making parts and assembling them into a finished product may have just one room in which all the machine and bench work is done. It is evident that the work performed by men at a bench, such as filing, assembling, and so forth, does not require as much overhead expense as the work performed on the machines. Therefore the bench work should be considered as a department distinct from the machine work. If the machines are similar and of approximately the same cost they may be figuratively grouped into another department. However, if the machines differ widely in style and price the operating cost per hour will not be uniform for all machines. Consequently a further subdivision of the machine department is required, unless it is found that high-priced employees operate the high-priced machines and low-priced employees operate the low-priced machines, and that the overhead cost per hour can be varied in accordance with the machine operated by applying it on a percentage rate of the labor cost. In other words, if a $.40 man operates a low-priced machine using very little power and costing very little to operate, and a $.75 man operates a high-priced machine using more power and costing more to operate, the overhead, if found to be an average of 100 per cent of the direct labor, would amount to $.40 and $.75 per hour respectively. If the difference between the two hourly costs of overhead compensates for the difference in cost of operating the two machines, this method may be adopted.

In small factories each department is usually self-sustaining in its operations, and consequently all departments are productive; but in large factories it is necessary to establish nonproductive as well as productive departments.

The departments actually working on and directly assisting in the creation of the finished product are classified as "productive," for it is on the work of these departments that the entire overhead of the factory is finally distributed.

The stock-keeping, millwright, power, and other depart-

ments not directly working on the product, but used mainly for the maintenance and operation of the factory itself, are considered to be nonproductive. The employees of the nonproductive departments perform no operations on the product and have no time which can be charged to the cost of creating any particular item manufactured in the factory, and therefore the total of the wages and expenses of these departments must be accumulated and then distributed to the productive departments in proportion to the benefits which they receive. The pro-rata share of the expenses of maintaining the nonproductive departments must be added to the other expenses of the productive departments before the overhead rates can be figured.

In some cases it is desirable to add an overhead to the purchase price of material to cover the costs of trucking, unloading, and placing the materials in stock, in addition to the freight charges which can be directly applied. As it is rare to find an equitable means of applying these general handling costs to the purchase price of the materials, they are most generally absorbed with the other items of overhead. When desirable, a small group of accounts may be used to accumulate these charges, which are then prorated to the various units upon such a basis as is found to be the most accurate in its results.

Overhead Expense Accounts

The accounts classifying the items of expense pertaining to the operation of the factory should be chosen not only to present a condensed analysis of the overhead total, but also to assist in the preparation of the overhead statement in which all of the manufacturing expenses are allocated to the productive departments. There are expenses incurred for a single department, and there are other expenses of a more general nature, which benefit more than one department. Departmental accounts should be provided for all items of expense which can be definitely accounted for by departments, so that the amount

chargeable to each department may be readily ascertained. In choosing the accounts for the items of expense which must be apportioned to the respective departments, a combination of items in one account, requiring different bases for distribution to the respective departments, should be avoided.

After classifying the expenses in such a manner as to present an analysis of the overhead total, a further division of the accounts adopted for the classification thus made is required to facilitate allocating the expense charges to the respective departments. If due consideration is given to those two requirements—the analysis of the overhead total and the departmental allocation of the expenses—the preparation of the chart of manufacturing expense accounts will be a simple task.

Fixed and Producing Expenses

After the chart of accounts has been determined it is advisable, for analytical and statistical purposes, to divide the manufacturing expenses or overhead into two groups, classifying the fixed expenses separately from the producing expenses.

The fixed expenses are those items which practically remain constant in amount and continue unaffected by the volume of production. Unless additional equipment is purchased, they remain at practically the same figure from month to month and are the chief cause of creating fluctuations in overhead rates as the production varies. The fixed expenses may include depreciation, taxes, insurance, rent, and possibly salaries of superintendents, foremen, janitors, stock-keepers, and such items as remain almost unaffected by a varying volume of production and are constant as long as the factory capacity is unchanged and its operations not entirely stopped. All of the items included in this class are practically a necessity to the existence of the factory organization regardless of the fluctuations in production.

The producing expenses include the remaining items of over-

head, comprising all the expenses incurred directly for the operation of the factory, varying in amount practically in proportion to the volume of production and therefore causing only a slight variation in the overhead rates. The producing expenses include supplies of all kinds, power, repairs, and such items as are more closely related to the production and to the operation of the factory than the items included among the fixed expenses.

Normal Operating Capacity

Normal operating capacity does not mean an average of past operations. In business, equipment should not be purchased in excess of the production needs. If it is purchased as an investment for possible future use or for any other purpose than immediate use, the expense of maintaining it should not be included in overhead. The overhead cost of an article is the charge for *using* the facilities of a factory, including the equipment and organization. A charge should not be included for facilities not used.

For the purpose of determining the amount of overhead to charge to the work performed in a factory, it is necessary to ascertain the maximum distributing units from a full use of the facilities: that is, if the overhead is to be distributed upon the basis of productive or direct hours it is necessary to compute the total number of working hours in each department for all the employees required to make full use of the facilities. The maximum distributing units should then be reduced to allow for normal delays and inefficiencies and the net result will represent the normal distributing units and will be the measure for determining the extent to which the facilities are used.

The departmental distributing rate of overhead is found by adding the fixed expenses per normal distributing unit to the producing expenses per actual distributing unit.

The Overhead Statement

The main purpose of the overhead statement is to allocate the expenses to the respective departments and to compute the distributing rates. It should also present a complete analysis of the overhead total, from which the responsibility for the expenditures may be placed. In preparing the monthly overhead statement, separate columns are provided for the expenses of each of the productive and nonproductive departments. The charges in each of the manufacturing expense accounts are entered in a total column on the statement and distributed to the various departments. The expense accounts for the sole use of a department are charged in their entirety to the department benefited by or responsible for the expense. The accounts for expenses to be charged against more than one department, such as insurance, taxes, superintendents, and so forth, are prorated to the departments in proportion to their benefit or responsibility. After all accounts have been distributed, the expenses for the nonproductive departments are added and apportioned to the productive departments, which are then totaled and proved with the total column. The productive departmental expenses thus found are, under normal operating conditions, distributed to the work performed in the respective departments.

CHAPTER IX

DISTRIBUTION OF OVERHEAD

Desirability of Simple Methods

Frequent reference has been made to the necessity of analyzing the conditions in each case in order to devise and adopt the most suitable methods of obtaining costs. The analysis should not end with the material conditions but should extend to the personnel as well. A large factory can afford to employ men with greater experience and ability than a small one, and it is folly to assume that the employees of a small factory can carry on a system embodying all the refinements and accuracy of a system devised for a large factory. It would probably be so far beyond their comprehension that its operation would soon be discontinued. Every man is capable of development but it must be done by progression. In the small factories it is better to start with a system as simple as practical accuracy will permit and gradually refine it as adjustments become necessary to meet the ever-changing conditions.

There is a degree of error in all factory costs due to the application and amount of overhead. One of the large items included in overhead is depreciation, and though it may be computed on a most elaborate and complicated basis it is even then only a guess. There are numerous other expenses which, if traced individually to the articles on which they are finally proportioned, may be found to be erroneously applied. One such small error is compensated by another and so the final figure is nearly correct without resorting to penny-wise methods. There is no justification for adopting any methods for the sake

of simplicity or other reasons, which might produce errors vitally affecting the successful operation of a factory, but there seems to be a stronger tendency to adopt methods unnecessarily complicated. A small percentage of error should always be permissible if compensated by simple methods resulting in a saving of clerical labor.

Methods of Distributing Overhead

There are several methods of distributing overhead to the cost of manufacturing various items in a factory. The method to be chosen depends upon the conditions existing in each particular case. The choice is vitally important. The method which is most simple and will give the most accurate results should be adopted, but necessary complications should never be avoided.

The distribution of overhead is generally confined to one of the following methods:

Direct labor costs
Direct labor hours
Machine hours
Unit of production

The four methods named above contain all the generic principles of distributing overhead. Innumerable variations of these methods are used for extraordinary cases, but as their difference is not in principle they are not of general interest and are not needed in explaining the theory of cost accounting.

Departmental Expenses

The first step in the distribution of overhead is the preparation of the departmental statements from the monthly charges in the expense accounts carried in the ledger. All the manufacturing expenses incurred specifically for a particular department are charged directly against it and each of the remaining

general expenses is prorated to the various departments in proportion to their share. Thus the total overhead for each producing department is found and the unit for distributing it or charging it against the work performed is determined in accordance with the method adopted.

In order to avoid confusion all references in this chapter to total overhead or departmental expenses are made with the assumption that the total conforms to the results obtained under normal operating conditions. The treatment of overhead under conditions other than normal differs only in the adjustment made to the total actual departmental expenses before the distributing rates are found, and as the effect on each of the following described methods is the same it has been made the subject of a separate chapter.

Direct Labor Cost Method

Basis of Proration. The direct labor cost method of distributing overhead to the individual jobs worked on uses the direct labor cost as the basis for making the proration. The overhead is distributed to the individual jobs in the same proportion to the labor cost thereof, as the total overhead of the department is to the total direct labor of the department. The total departmental expenses are divided by the total direct labor for the same month or period, and the resulting percentage is used as a basis for determining the overhead to be distributed or added to the labor cost of each job worked on in that department. To illustrate with figures, we will assume that the total departmental expenses for a month amounted to $1,500 while the direct labor was $2,000. Dividing the $1,500 by $2,000, it is found that the expenses are equal to 75 per cent of the direct labor. Therefore an amount for overhead is added to the individual cost sheets for work done in the department, equal to 75 per cent of the cost of the direct labor charged from that department. As the aggregate of the labor for the period

posted to all cost sheets was $2,000, the total of the overhead prorated would consequently be $1,500, and the entire departmental expenses would be absorbed.

When Method Is Misleading. This method is simple and easy to operate. All the figures required are easily obtained. Analyzing its effect when the element of time is considered it will be seen that the amount of overhead per hour charged to a job varies in proportion to the hourly wage of the men employed thereon. If the overhead is equal to 80 per cent of the direct labor cost, the cost of performing a job requiring one hour of labor would in the case of an employee receiving wages of $.60 per hour amount to $1.08 ($.60 wages plus 80 per cent, or $.48 for overhead), while in the case of an employee receiving wages of $1 per hour the cost of performing one hour's work would be $1.80 ($1 wages plus 80 per cent, or $.80 for overhead). Thus in the first case the overhead cost is figured at $.48 per hour and in the second case at $.80 per hour. The adoption of this method can be justified only by the nature of the operations performed by the respective employees. It will produce results as correctly as the labor-hour or machine-hour methods if all employees in each department perform the same kind of operations at the same hourly wage, but if employees performing the same operations receive unequal wages, the costs figured on this basis are misleading.

If two machinists are performing the same kind of work and one receives wages of $1 per hour because he is 25 per cent more efficient than the other who is paid $.80 per hour, then the labor cost of the work performed by each would be the same because the less efficient employee would consume 25 per cent more time than the other. The labor cost of a one-hour job for the efficient employee who receives $1 per hour would be $1, and if the less efficient employee at $.80 per hour required 1¼ hours to do the same job, the labor cost would also be $1. The overhead, if applied under the direct labor cost method,

would be the same amount and therefore wrong for it naturally costs more to operate a machine 1¼ hours than it does 1 hour. If the rate of overhead was 80 per cent of the labor cost the amount charged to the job would be $.80 in both cases, or $.80 per hour for the efficient employee and $.64 per hour for the other employee. As quantity production has such a vital effect upon the profits there is no justification for favoring the slow producers by the adoption of this method under such conditions.

Use of Different Methods in Same Factory. There are cases where the difference in hourly pay of various employees is in nearly the same ratio as the difference in the hourly overhead costs. But before any method is adopted a thorough analysis should be made of the manufacturing expenses and their relation to the various operations performed in order to determine the most equitable basis on which the overhead may be apportioned to the operations. Different methods may be used in the same factory for the distribution of overhead in the various departments. It may be found that the wages of certain employees were $1 per hour, while others in the same operating department drew $.60 per hour and that from the analyses made, the approximate overhead rates on each were respectively $.80 and $.48 per hour, equaling 80 per cent of the wages paid. In such cases the amount of overhead distributed to the costs would be the same on either the hourly or labor cost basis, but in order to avoid subdividing the operating department the simplicity of the direct labor cost method makes it preferable.

If employees performing like operations in a department or in an entire factory are compensated at the same hourly wage, and if all differences in wages for the respective operations are in proportion to the variation in overhead costs per direct labor hour, the direct labor cost method of distributing overhead at a uniform percentage of labor cost may be correctly and advantageously applied.

Direct Labor Hour Method

METHOD EXPLAINED. The direct labor hour method distributes overhead to the cost of the respective jobs on the basis of the hours consumed by the employee in performing his work. The total departmental expenses are divided by the total number of direct labor hours for the same period and the resulting rate per hour is used as a basis for determining the overhead to be distributed and added to the labor cost of each job. If the total departmental expenses for a month amounted to $2,000 and the total direct labor hours were 2,500, the overhead per direct labor hour would be $.80. Therefore, on every cost sheet to which labor had been posted for the month, overhead would be added at the rate of $.80 per labor hour.

MORE ACCURATE METHOD. In nearly all instances the element of time should determine the correct proportion of overhead to be applied to the respective jobs. If an employee works two hours machining a certain part and another employee completes the same operation on a similar part in one hour, it is certain that twice as much overhead should be charged for the use of the machine for two hours as for one hour. The less efficient employee reduces the production of a given period and thereby increases the average overhead per article, but by distributing overhead on the basis of labor hours the charge is made against the individual responsible for the inefficient work. Assuming that the wages of these two employees were, in accordance with their productive ability, respectively $.50 and $1 per hour, and the overhead for their department was $.80 per hour: then the cost of the work performed by the employee requiring two hours would be $2.60 ($1 wages and $1.60 overhead for two hours) and the cost of the same work performed by the higher-paid employee would be $1.80 ($1 wages and $.80 overhead for one hour). The difference in the cost of the work of the two employees is the overhead for one hour.

This method is safer to adopt than the direct labor cost method for its accuracy is unaffected by changes in hourly wages. It distributes the overhead in proportion to the length of time the equipment is used and in most cases this will prove to be more equitable than any other method.

Machine Hour Method

Method Described. The machine hour method provides for combining the direct labor and overhead cost of operating a machine in one amount per operating hour of the machine. The accuracy of this method, like all other methods, depends upon an accurate departmental accounting of the factory. The different machines are accounted for as a class or department, and the whole idea is to classify the work into operating units of a similar cost.

When adopted for all departments in a factory the wages of operators and the entire overhead are first distributed to the various operating departments. The departmental charges are then allocated to the subdivisions in which the different machines or batteries of like machines in the department are classified. Each class is given a symbol number and the operators charge their time to the symbol number representing the machine or battery of machines on which they work. The labor cost charges are combined with the overhead charges to determine the total cost of operating the respective machines or batteries of machines, and the total is then divided by the number of hours which the machines operate in order to arrive at the cost per operating hour.

A record is kept of the time each machine operates on a job and the cost is determined by multiplying the machine hours by the cost per hour, including the direct labor and overhead, of operating the machine.

This method simplifies the recording of the employee's time but it requires a record of the work performed by the machine.

It also combines the extension of labor and overhead on the cost sheet into one operation, and the only direct cost shown on the cost sheet is for the material used. The clock number of the employee performing the work may be posted to the cost sheet and if the hourly wage of the operator is known, the direct labor can be easily determined; and by deducting it from the total machine cost the overhead can also be found, providing the employee is operating a single machine and not a battery of machines.

Where an average machine hour cost is determined for a large number of machines operated by employees receiving various hourly wages, a production record should be kept on which the efficiency of the respective employees may be compared. Such records are extremely valuable, especially to factories making a standard product, and while they are not required to obtain the cost figures the cost accountant should originate them.

Compulsory Application of Method. The machine hour method is practically the only method by which costs can be determined in cases where the employees operate a battery of machines, such as automatic screw machines. The employee may operate a battery of possibly six machines which would each be performing work on separate orders. The time of each machine may be easily accounted for, but in view of the fact that the employee is constantly dividing his time between the various machines and possibly spending more time on one machine than another, due to faults in the machine and not caused by the work, it would be an almost impossible task for the employee to distribute his time. However, a record of the operations of the respective machines is very simple and easy to obtain. A card is provided daily for each machine on which the employee may record the order number of the job for which the machine is used, the time that the machine was consigned to the work, and the time that the work was completed.

Spaces must also be provided on the card for the office extensions.

In an automatic machine shop the machine operator in most cases does not set up his machines. This task is usually performed by men employed solely for that purpose, and as there is a wide variation in the time required to set up a machine it is in most instances advisable to have the set-up man charge his time directly to the production order for which he is setting the machine and not to the machine number. The overhead on his time may be applied through the machine rates or added as a separate item on the cost sheet at a rate figured on the basis of wages or hours, which will absorb his share of the general overhead.

Unit of Production Method

Explanation of Method. The unit of production method may combine all of the costs into one rate per pound or other unit of the product, or either or both of the direct costs may be recorded separately and only the overhead figured on the basis of the unit. The total departmental expenses are divided by the total units of production completed during the same period in which the expenses are accrued, and the resulting rate per unit is used as a basis for determining the overhead to be charged to the cost sheets for each job. When the material and labor costs can be correctly averaged, they are added to the departmental expenses and the total is divided by the production to obtain the combined cost of all elements in one figure.

Application of Method. Referring again to a foundry, since its conditions are the most universally known, the cost of the metal poured is determined by combining the cost of all metals melted in the crucibles, with the wages of the employees tending the furnaces, pouring the metals and so forth, and the overhead expenses pertaining thereto. The total cost so obtained for a period is divided by the total number of pounds

produced in castings and the result is used as the average total cost per pound of the metal poured. In the event that more than one kind of casting is made, such as brass and aluminum, the material cost is recorded for each and the labor and overhead are prorated in proportion to the weight of each and added thereto in order to determine the total cost of each. Dividing these costs by the respective weight of castings in brass and aluminum, the cost per pound is determined, and the cost of the individual castings produced is found by multiplying their weight by the unit cost. In view of the wide variation in the time required by molders for differently shaped castings, it is generally advisable to have their time charged directly against the order or article on which they work, applying a separate overhead for their department.

This method is not only used for foundries but for paint factories, paper mills, and so forth, where the unit of production provides a just basis of distributing the overhead. There are instances where the material is treated as a direct cost and the labor and overhead are combined and apportioned on the unit basis; and there are other instances where the material and labor are charged directly and the overhead only is thus distributed.

Clerical Operations

The clerical methods of entering overhead on the cost sheets, under the direct hour or labor cost methods, are not fixed by rule. It may be figured and proved on the summary of time tickets, and then posted with the labor to the cost sheets; or it may be figured monthly from the postings on the cost sheets and a recapitulation made to prove it with the product of the rate and total taken from the payroll distribution for the month. Whatever method is adopted it must have a systematic routine which will permit the work to be done speedily and accurately and enable all figures to be traced.

CHAPTER X

COST CONTROLLING ACCOUNTS

Need of Controlling Accounts

Controlling accounts for all cost records should always be carried in the general ledger. A controlling account is merely a means of eliminating detail from the general ledger. In opening the account an entry is made to it for the total of the detailed items transferred to the subsidiary records. The totals of the subsequent individual debit and credit postings to the subsidiary records are entered monthly in the controlling account. Thus at the close of each month the net total of all items in the subsidiary records agrees with the balance in the controlling account.

The accuracy of the reports issued by the factory employees and the correctness of all cost figures can be verified only by perpetuating the inventory figures through controlling accounts in the general ledger, and proving them periodically by comparison with physical inventories. It sometimes happens that the factory employees will try to hide their defective work by issuing erroneous reports, and if not found through unexpected material shortages the resulting discrepancies will be uncovered when the total values of the physical inventories are compared with the controlling accounts. Any errors in the work of the cost clerks will likewise be revealed.

If a cost system is not dovetailed with the financial accounts of the general ledger, the results are almost invariably unreliable. When controlling accounts are not used, overhead statements are usually not made and the advantage of holding

the factory executives to accountability for their expenditures is lost. Unless overhead statements are a part of the cost system the rates of overhead are a mere estimate based upon other estimates which are not supported by actual experience.

Without controlling accounts it is almost impossible to prepare monthly financial and profit and loss statements. There are many instances where wastes originating in the first month of a fiscal year continue unknown during the remaining eleven months of the year until attention is finally called to them in the presentation of an annual profit and loss statement. If the cost records are properly controlled it is no more effort for the bookkeeper to prepare a monthly financial and profit and loss statement than it is to take an ordinary trial balance. When monthly statements are prepared any extravagance originating in any one month may then be immediately observed and stopped. Such statements also disclose the accounts perpetuating the inventory balance and offer the management a check on the purchasing department.

Number of Controlling Accounts Required

The choice of accounts and methods used to control the cost figures will depend upon the nature and amount of detail in each case. For factories of average size it is unnecessary to use a subsidiary ledger for the manufacturing expense and inventory accounts as they may be best carried in subdivisions of the general ledger. It is possible to have too many controlling accounts, and if such is the case the work will become burdensome. A large manufacturing concern will carry a factory ledger in which all of the factory expenses and inventories will be recorded. It will contain the controlling accounts for all the cost records, and the entire factory ledger with its controls and other accounts will be in turn controlled by one account in the general ledger. If the theory of cost controlling accounts as applied to a small factory is understood, the added

requirements for a large factory will be easily comprehended. The difference between the two is merely a point of detail. If it is preferable to carry the factory accounts in a subsidiary ledger, no difficulty will be encountered in withdrawing them from the general ledger and opening one controlling account in their stead.

Controlling Accounts Illustrated—Journal Entries

The general principles underlying the operation of the controlling accounts which are used to connect the cost records with the financial books may be clearly shown by a concrete illustration. The journal entries which are typical of those required for a system acquiring production order costs, and an outline of the controlling ledger accounts required are given for the average factory in the following pages of this chapter. It is assumed in the illustration that the factory makes some of the parts used in its product and also purchases some, that to expedite production minor assemblies are made from certain parts and stocked until required, and the finished product is an assembly of the minor assemblies together with other parts, and that repairs are made in the factory for its customers, and parts are also sold for repairs made elsewhere. At the close of each month, after the books are posted and the journal entries relating to the controlling accounts are made, the operating and financial statements may be prepared from the account balances without further adjustments. By arranging the accounts in a classified order the preparation of the monthly statement will be further simplified. The journal entries taken are as follows:

Journal Entry No. 1

Dr.—Work in Process
    Cr.—Raw Material Stores
Total cost of raw material withdrawn for production, from requisitions for the month.

Journal Entry No. 2

Dr.—Raw Material Stores
    Cr.—Work in Process

Total cost of material withdrawn for production but returned to the storeroom unused, from transfer slips or credit memos for the month.

Journal Entry No. 3

Dr.—Material Scrapped
    Cr.—Raw Material stores
Raw material scrapped from storeroom during the month, from stockkeeper's report.

Journal Entry No. 4

Dr.—Material Spoiled and Scrapped
    Cr.—Work in Process
Total cost of material found to be or made defective in process of manufacture, from transfer slips or credit memos for the month.

> (NOTE.—In the event that it is desirable to have the cost of the article manufactured absorb the cost of material spoiled, this entry would not be made. The entry has the advantage of accumulating the losses from such causes, and attracting the attention of the management. The cost should include the labor performed on the material, with its overhead.)

Journal Entry No. 5

Dr.—Various Expenses (itemized to correspond with ledger accounts kept)
Dr.—Work in Process
    Cr.—Accrued Payroll
Distribution of the total factory payroll, from summary of time tickets and salary payroll for the month.

Journal Entry No. 6

Dr.—Work in Process
    Cr.—Overhead Distributed
Total overhead distributed to cost sheets, from summary for the month.

Journal Entry No. 7

Dr.—Equipment Accounts (as designated on orders)
Dr.—Various Expenses (as designated on orders)
    Cr.—Work in Process
Total cost of equipment orders and so forth completed during the month, from cost sheets.

Journal Entry No. 8

Dr.—Finished Parts Stores
    Cr.—Work in Process
Total cost of parts and minor assemblies completed and delivered to storeroom during the month, from cost sheets.

Journal Entry No. 9

Dr.—Work in Process
    Cr.—Finished Parts Stores
Total cost of parts and minor assemblies used in production during the month, from summary of requisitions.

Journal Entry No. 10

Dr.—Finished Parts Stores
    Cr.—Work in Process
Total cost of parts and minor assemblies withdrawn for production and returned to the storeroom unused, from transfer slips or credit memos for the month.

Journal Entry No. 11

Dr.—Finished Products Stores
    Cr.—Work in Process
Total cost of product completed during the month, from cost sheets.

Journal Entry No. 12

Dr.—Cost of Sales—Miscellaneous
    Cr.—Raw Material Stores
Total cost of raw material sold during the month, from sales summary.

Journal Entry No. 13

Dr.—Cost of Sales—Repairs
    Cr.—Work in Process
Total cost of repair orders completed for customers during the month, from cost sheets.

Journal Entry No. 14

Dr.—Cost of Sales—Repairs
    Cr.—Finished Parts Stores
Total cost of parts shipped to customers for repairs during the month, from sales summary.

Journal Entry No. 15

Dr.—Finished Parts Stores
    Cr.—Cost of Sales—Repairs
Total cost of parts returned from customers for credit during the month, from sales summary.

Journal Entry No. 16

Dr.—Gratis Repairs
    Cr.—Finished Parts Stores
Total cost of parts shipped gratis to customers for repairs during the month.

Journal Entry No. 17

Dr.—Cost of Sales—Product
    Cr.—Finished Product Stores

Total cost of finished product shipped to customers during the month, from sales summary.

Journal Entry No. 18

Dr.—Finished Product Stores
Cr.—Cost of Sales—Product

Total cost of finished product returned from customers for credit during the month, from sales summary.

Controlling Account Ledger Entries

On the following pages a prospectus is given of the accounts controlling the cost records, showing the debit and credit entries to each and a description of what the balance represents. The "J. E." numbers affixed to the entries in the controlling accounts refer to the foregoing journal entries. It is obvious that the amounts which would be used for the entries should be in accordance with the values at which the items are carried on the books and records supporting the controls.

RAW MATERIAL STORES

Debit	*Credit*
Inventory at start of period.	Raw materials returned to shipper from whom purchased.
Purchases of raw materials.	Raw materials withdrawn for production, from requisition for the month. (J. E. No. 1.)
Raw materials withdrawn for production and returned to the storeroom unused, from transfer slips or credit memos for the month. (J. E. No. 2.)	Raw materials scrapped from storeroom, from stock-keeper's report. (J. E. No. 3.)
	Raw materials sold, from sales summary. (J. E. No. 12.)

The balance in this account at the close of each month represents the cost of the raw material on hand and should agree, if the total cost is extended on each stock record card, with the total of the balances on all raw material cards. It should be verified at least once a year by taking a physical inventory, when the balance on the individual stock record cards should be ruled

off and the quantity actually found to be on hand should be entered. If a discrepancy of importance is found between the inventory count and the quantity on hand according to the stock record, the item should be re-inventoried, and if the first count proves to be correct, all the entries on the stock record card should be investigated and the cause of the discrepancy located. The accuracy of the important items should also be tested occasionally during the year by comparing the quantity actually on hand with the balance shown on the stock record cards.

WORK IN PROCESS

Debit	*Credit*
Inventory at start of period.	Raw materials withdrawn for production and returned to the storeroom unused, from transfer slips or credit memos for the month. (J. E. No. 2.)
Raw materials withdrawn for production, from requisitions for the month. (J. E. No. 1.)	Materials found to be or made defective in process of manufacture, from transfer slips or credit memos for the month. (J. E. No. 4.)
Direct labor, from summary of time tickets for the month. (J. E. No. 5.)	Equipment orders and so forth completed during the month, from cost sheets. (J. E. No. 7.)
Overhead distributed to cost sheets, from summary for the month. (J. E. No. 6.)	Parts and minor assemblies completed during the month, from cost sheets. (J. E. No. 8.)
Parts and minor assemblies used in production during the month, from summary of requisitions. (J. E. No. 9.)	Parts and minor assemblies withdrawn for production and returned to the storeroom unused, from transfer slips or credit memos for the month. (J. E. No. 10.)
	Product completed during the month, from cost sheets. (J. E. No. 11.)
	Repair orders completed for customers, from cost sheets. (J. E. No. 13.)

The balance in this controlling account at the close of each month represents the cost of all work in process of manufacture and should agree with the total of the balances on all cost sheets. It should be verified at least once a year by comparison with a physical inventory, and the individual cost sheets should be adjusted in accordance therewith. Defective work is sometimes covered up by using material withdrawn for one order in the production of another. Such practice can be checked by occasionally inventorying the orders in process where a misappropriation of materials may exist.

FINISHED PARTS STORES

Debit	*Credit*
Inventory at start of period.	Finished parts returned to shipper from whom purchased.
Purchases of finished parts.	Parts and minor assemblies used in production during the month, from summary of requisitions. (J. E. No. 9.)
Parts and minor assemblies completed and delivered to storeroom during the month, from cost sheets. (J. E. No. 8.)	Parts shipped to customers for repairs during the month, from sales sheets. (J. E. No. 14.)
Parts and minor assemblies withdrawn for production and returned to the storeroom unused, from transfer slips or credit memos for the month. (J. E. No. 10.)	Parts shipped gratis to customers for repairs during the month. (J. E. No. 16.)
Parts returned from customers for credit, from sales summary. (J. E. No. 15.)	

The balance in this account at the close of each month represents the cost of all finished parts and minor assemblies on hand and should agree, if the total cost is extended on each stock record card, with the total of the balances on all the cards. It should be verified at least once a year by taking a physical inventory, and the balances on the individual cards should be adjusted accordingly. If any discrepancy of importance is found between the inventory and the stock record, the item

should be recounted and all entries on the stock record cards should be investigated and the cause of the discrepancy located. The accuracy of the important items should be tested occasionally during the year by comparing the quantity on hand as shown by the stock record cards with an actual count of the items.

FINISHED PRODUCT STORES

Debit	*Credit*
Inventory at start of period. Product completed during the month, from cost sheets. (J. E. No. 11.) Finished product returned from customers for credit. (J. E. No. 18.)	Finished product shipped to customers during the month. (J. E. No. 17.)

The balance in this account at the close of each month represents the cost of all completed product on hand and should agree, if the total cost is extended on each stock record card, with the total of the balances on all cards. It should be verified at least once a year by taking a physical inventory and the balances on the individual cards should be adjusted accordingly. If any discrepancy of importance is found between the inventory and the stock records, the item should be re-inventoried and all the entries on the stock record cards should be investigated and the cause of the discrepancy located. The accuracy of the individual cards should be occasionally tested during the year by comparing the quantity on hand as shown by the stock record cards with an actual count of the items.

OVERHEAD DISTRIBUTED

Debit	*Credit*
At time books are to be closed, with the total of all manufacturing expense accounts.	Overhead distributed to cost sheets, from summary for the month. (J. E. No. 6.)

Prior to the time of closing the books the balance in this

account represents the amount of overhead distributed to cost sheets and on the monthly statement is used as a deduction from the total of the manufacturing expenses in order to determine the amount of undistributed or overdistributed overhead. When closing the books the manufacturing expenses are closed into this account and the resulting balance, being the difference between the actual overhead and the amount distributed, may be closed into the Cost of Sales account or directly to the Profit and Loss account.

ACCRUED PAYROLL

Debit	*Credit*
All payments of wages and salaries.	Total factory payroll for the month. (J. E. No. 5.)

The balance in this account represents the liability for unpaid salaries and wages at the close of each month. It is important that all wages or salaries earned by employees should be entered on the payrolls so that the distribution of the labor charges may be ascertained in a routine manner without confusion. By charging all payments for labor to this account and proving the liability at the close of each month, any duplicate payments made in error may be easily detected.

CHAPTER XI

PLANNING THE DESIGN AND SIZE OF FORMS

Design of Forms

After devising the methods by which the costs of a factory are to be ascertained, it is a simple task to design the forms to be used for reporting and accumulating the cost data.

When a tentative design of a form is drawn it should be carefully studied before finally adopting it, to see that its arrangement will permit the most effective service in all of its uses. Many of the cost forms have more than one use or purpose, and very often the same information is required on more than one form. This may be illustrated by the reports required to make a shipment from stock to a customer. First, the shipping clerk must be instructed and the order recorded in the office. Second, the stock-keeper must have a requisition for the material withdrawn from his stockroom. Third, a packing slip must be sent with the shipment. Fourth, an invoice must be sent to the customer when the goods are shipped. It frequently happens that the same information, except for the monetary extensions, is to be recorded on each of the reports thus required, and if the printing is uniformly arranged the instructions on the forms may be typed in sets with carbon copies of the original. Very often such opportunities exist but are lost through concentration on single requirements.

Consideration should also be given the final disposition of the figures on a form. It takes much longer to post each of a quantity of items than it does to add and post the total of the same items for an adding machine list. If, for instance, each

employee makes one time report for each day on which he reports the time he works on each order, the cost clerks would be required to post the individual charges to the respective cost sheets. If twenty employees work on the same order during the day, there will be twenty postings to the same cost sheet. But if the forms provided permit the employees to record the time they work on each order on a separate time ticket, then the tickets may be sorted and added on a machine, and only one posting made from the total for the day, week, or month, as the case may be.

The location on the forms of the items to be reported should also be carefully planned. The important items should be located so that they may be discerned at a glance. The filing reference should always be in the upper right-hand corner and the figures to be summarized or posted should be to the right of other figures.

It takes time to make reports and for that reason every bit of information requested on each report should be carefully considered to see that it is of absolute necessity to the operation of the cost system. Never forget that it costs money to have reports made and that every penny so spent should yield a return in benefits from the cost system which should be visible in the net profits. Only information of useful value should be requested.

Size of Forms

Each form should be as small and compact as possible. Extremely large forms are cumbersome and should be avoided. A form that is too small for its purpose is also undesirable. Small, cramped writing takes time. The factory man's fingers are not as nimble as the office man's, and his writing is large. A generous amount of space should be allowed for the writing he may have to do on the cost forms so that he will not waste his time trying to crowd it into a small space nor waste the time

of the cost clerks by sprawling it over the spaces they must use.

Cost of Forms

The cost accountant should familiarize himself with the operations required to print and rule forms. If he is familiar with the printer's method of setting up and ruling a form, he can adhere to economical designs. Very often a slight change can be made in the design or size of a form which will decrease its cost very materially.

PART II

OPERATING STATEMENTS AND USES OF COSTS

CHAPTER XII

PREPARATION OF OVERHEAD STATEMENTS

Direct and Joint Departmental Expenses

The preparation of overhead statements necessitates dividing a factory into such departments as are required to obtain a correct apportionment of the manufacturing expenses to the work performed. After the departments are established it is necessary to provide accounts for such of the expenses of each department as can be directly accounted for. Next, accounts should be adopted for the expenses of a general nature which are incurred for the benefit of more than one department. It will be noticed that there are direct departmental expenses and there are also expenses for all or a group of the departments, which may be called "joint departmental expenses."

The joint departmental expenses include all expenditures which cannot be charged in their entirety to any one department but must be apportioned to the departments for which they were incurred in proportion to the benefits received. An arbitrary basis may be the only possible method for the allocation of some of the joint expenses, while for others a relation may be found to other data which may be used. Certain expenses may be most justly distributed to the departments in proportion to the departmental labor, but the floor space may be the best basis for others, and so on. The most equitable basis to use for the proration of each account must be determined from an analysis to ascertain the relative departmental benefits from the charges contained therein.

General Principles of Expense Distribution Illustrated

There are no exact rules for choosing a basis for the distribution of an account to the proper departments, but the general principles may be derived from the explanation of the overhead statement presented in this chapter, which is given as simply as possible to avoid needless confusion and still illustrate the manner in which the departmental expense totals may be determined. The accounts used in the statement are assumed to represent all of the factory expenses, and the amounts are assumed to have been taken from the ledger. Each account and the basis used for allocating the expenses to the respective departments are described immediately following the statement.

The result desired in the preparation of an overhead statement is to allocate all of the factory expenses to the various departments in the most equitable manner. The illustration given in this chapter is merely to show the possible application of certain bases for proration of the joint departmental expenses; and it is not presented as a standard form to follow for all cases.

General and Departmental Overhead Statements

A statement of overhead expenses should be prepared for each month. It is also advisable to prepare separate statements for each department, in which the results for the fiscal year may be accumulated. The account names are entered on the left of the cumulative departmental statement; the first column is for the month of January if the books were closed with the calendar year; the second column, for the month of February; the third column, for the total to date; and so continued for the remaining months. The use of a six-column fly-leaf would reduce the size of the statement. After the statement distributing the expenses to the respective departments is made, the charges to each department are also entered in the column for the corresponding month on the cumulative statement. The

Manufacturing Overhead Statement
For the Month of January

	Total	General	Dept. A	Dept. B	Dept. C
Fixed Expenses:					
1. Salaries—Superintendent	$300.00	$300.00			
2. " Foremen	630.00		$215.00	$229.00	$186.00
3. " Factory Accounting and Purchasing	500.00	500.00			
4. " Draftsmen	200.00	200.00			
5. Depreciation—Building	120.00		30.00	30.00	60.00
6. " Machinery	400.00		120.00	200.00	80.00
7. Taxes—Local	160.00		40.00	64.00	56.00
8. Insurance—Fire	80.00		20.00	32.00	28.00
9. Heat	60.00		15.00	15.00	30.00
10. Telephones	30.00		10.00	10.00	10.00
11. Distribution of General Expenses		$1,000.00	300.00	200.00	500.00
Total Fixed Expenses	$2,480.00		$750.00	$780.00	$950.00
Producing Expenses:					
12. Wages—Stock-keepers, etc.	$225.00	$225.00			
13. " Truckers	175.00	175.00			
14. " Inspectors	300.00		$75.00	$75.00	$150.00
15. " Janitors	150.00	150.00			
16. " Miscellaneous Indirect Labor	426.00		202.10	125.90	98.00
17. Repairs—Building	80.00		20.00	20.00	40.00
18. " Machinery	130.00		40.00	75.00	15.00
19. Power	104.00		40.00	56.00	8.00
20. Light	50.00		12.50	12.50	25.00
21. Small Tools	50.00		10.00	15.00	25.00
22. Departmental Supplies	250.00		45.00	30.00	175.00
23. General Supplies	60.00	60.00			
24. Insurance—Employers' Liability	60.00		20.40	15.60	24.00
25. Transportation on Incoming Materials	100.00	100.00			
26. Materials Spoiled and Scrapped	40.00	40.00			
27. Stationery—Factory	20.00	20.00			
28. Drafting Supplies	10.00	10.00			
29. Miscellaneous Expenses	120.00	20.00	35.00	25.00	40.00
30. Distribution of General Expenses		$800.00	250.00	150.00	400.00
31. Total Producing Expenses	$2,350.00		$750.00	$600.00	$1,000.00
32. Fixed Expenses (see above)	2,480.00		750.00	780.00	950.00
33. Total Overhead	$4,830.00		$1,500.00	$1,380.00	$1,950.00
34. Deduct Overhead Distributed to Costs	4,375.00		1,375.00	1,200.00	1,800.00
35. Balance Undistributed	$455.00		$125.00	$180.00	$150.00
36. Normal Direct Hours			3,000 hr.	2,000 hr.	5,000 hr.
37. Actual Direct Hours			2,500 hr.	1,500 hr.	4,000 hr.
38. Fixed Expense per Hour—Actual			$.30	$.52	$.23¾
39. " " " " Normal			.25	.39	.19
40. Producing Expense per Hour—Actual			.30	.40	.25
41. Total Overhead per Hour—Normal Basis			.55	.79	.44
42. Average Rates Used			.55	.80	.45

Figure 1.—Manufacturing Overhead Statement

entries for the current month are then added to the total at the close of the previous month and the new total is entered in the next column as the "total to date."

It is also desired to call attention to the fact that the distinction between a fixed expense and a producing expense is not determined by the name of an account. Conditions can be imagined which will place almost any account in either class. Building repairs may be as "fixed" as the depreciation on a building or they may vary with the volume of production within the building. True repairs to a building, not replacements, are most generally due to the use of the building.

Items in Overhead Statement Explained

On the statement shown in Figure 1 each item is given a number for reference in the following description. The reasons given for the methods used to prorate the various items are based upon the conditions assumed to have been found in the particular case. As conditions vary, so will the methods vary.

1. Salary of Superintendent. It was found that the superintendent performed no direct productive work and that each department benefited from his services in proportion to its size. Therefore, the salary of $300 paid to him is entered in the "General" column to be prorated with other items in proportion to the normal direct or productive hours.

2. Salaries of Foremen. It was found that a foreman was employed for each of the three departments and the salary of each is charged to his respective department.

3. Salaries of Factory Accounting and Purchasing Employees. The salaries of the cost accounting, payroll, and purchasing employees have been charged to this account. Considering the time required to record the materials purchased, the requisitions, and the time tickets, together with all the other computations in the cost department, it was decided that the

work created by each department was in proportion to its size. Therefore, the total of this account is entered in the "General" column to be prorated in proportion to the normal direct hours.

4. Salaries of Draftsmen. It was found that the services of the draftsmen were of a general nature for the benefit of the entire factory, and that the most equitable basis of allocating this item to the departments would be in proportion to their size, as shown by the normal direct hours.

5. Depreciation—Building. An entry is made monthly for one-twelfth of the annual depreciation charge on the building. As it was found that the floor space was worth an approximately equal value per square foot, the space used by each department was measured and the depreciation was apportioned accordingly. The depreciation of $120 for the building was divided by the space used by all departments, totaling 8,000 square feet, and the result, amounting to $.015, was multiplied by the square feet used in each department to determine the charge for each, as follows:

DEPARTMENT	SQ. FT. USED	BUILDING DEPRECIATION
A	2,000	$30
B	2,000	30
C	4,000	60
Total	8,000	$120

6. Depreciation—Machinery. An entry is made monthly for one-twelfth of the annual depreciation charge for machinery. As the amount of the annual charge is based upon 10 per cent of the cost of the machinery, an analysis of the purchases was made to determine the cost of the machinery in each department. Therefore, the monthly charge to each department was found by taking one-twelfth of 10 per cent of the cost of the machinery, as follows:

DEPARTMENT	COST OF MACHINERY	DEPRECIATION
A	$14,400	$120
B	24,000	200
C	9,600	80
Total	$48,000	$400

7. TAXES—LOCAL. The charge to this account represents one-twelfth of the annual amount paid for taxes on property, excluding all excise and income taxes. As the amount of these taxes is based upon values, a schedule was prepared of the approximate cost of the taxable property in each department, and the taxes were apportioned to each department in the same proportion as the cost of its taxable property was to the total for all departments, which is scheduled as follows:

DEPARTMENT	APPROXIMATE COST OF TAXABLE PROPERTY	PERCENTAGE OF TOTAL COST	TAXES
A	$24,000	25	$40
B	38,400	40	64
C	33,600	35	56
Total	$96,000	100	$160

From the above schedule, it will be readily seen that 25 per cent of the $160 tax expense was charged to Department A, 40 per cent to B, and 35 per cent to C. These percentages are used from month to month until some radical change is made in the relative cost of the taxable property of the various departments.

8. INSURANCE—FIRE. The charge to this account represents the monthly cost of premiums on fire insurance policies and is prorated to the respective departments in proportion to the cost of the insurable property in each, as shown in the following schedule:

DEPARTMENT	COST OF PROPERTY	PERCENTAGE OF TOTAL COST	TOTAL COST
A	$20,000	25	$20
B	32,000	40	32
C	28,000	35	28
Total	$80,000	100	$80

The cost of the property shown above represents, in addition to the cost of the equipment in the department, an apportionment of the building cost and an approximation for the productive material inventory. The percentages are used from month to month until some radical change is made in the relative departmental cost of insurable property.

9. Heat. There are many methods for prorating the cost of heat, but it was found in this case that the floor space would be as equitable a basis as any. Therefore, the charge is divided by the total square feet used by all departments and the result is multiplied by the square feet in each department to determine the amount chargeable to each, as follows:

DEPARTMENT	SQ. FT. USED	HEAT
A	2,000	$15
B	2,000	15
C	4,000	30
Total	8,000	$60

10. Telephones. As a telephone was installed in each department, one-third of the cost per month is charged against each.

11. Distribution of General Expenses. As each of the fixed expenses entered in this column is to be prorated upon the same basis, the computations are reduced by segregating them in this manner and apportioning only the total. As these expenses are necessary to the operation of the factory, even

though running at only 50 per cent of the normal capacity, they have been classified as fixed expenses, and as such it was found that the most equitable manner of prorating them would be upon the basis of the normal direct hours. The total possible direct hours of all employees in each department, when operating at full capacity, were discounted to provide for normal inefficiencies, and the normal operating hours were thus found and used as a basis to prorate these expenses in total, as follows:

DEPARTMENT	NORMAL OPERATING HOURS	FIXED GENERAL EXPENSES
A	3,000	$300
B	2,000	200
C	5,000	500
Total	10,000	$1,000

12. Wages of Stock-keepers. 13. Truckers. It was found that the work of stock-keeping, receiving incoming materials, and trucking materials from one department to another was divided among the respective departments in the same ratio as the actual direct hours of each are to the total for all departments. Therefore, the wages paid are entered in the "General" column to be prorated with other similar items in accordance with the actual direct hours of each department.

14. Wages of Inspectors. It was found that one inspector divided his time about equally between Department A and Department B, and consequently one-half of his salary is charged against each. Another inspector is employed constantly in Department C which is charged with the entire amount of his wages. In some instances it may be practical to treat the wages of inspectors as a direct charge against the cost of the work inspected, but it is assumed here that their time is divided among so many different jobs that it is impractical to distribute it in any other way except as an item of overhead.

15. Janitors. The services of the janitors were found to be general, and the most equitable manner of distributing their wages to the respective departments was decided to be in accordance with their size, as indicated by the actual direct or productive hours.

16. Miscellaneous Indirect Labor. The charges to this account originate from the time tickets on which there is also recorded the department in which the labor was performed. Therefore, the amount chargeable to the respective departments is a direct charge from the time tickets.

17. Repairs—Building. Occasionally there are repairs made to a building which were caused by the operations in a certain department, and in such cases the building repairs should be charged against that particular department. Usually building repairs are of a general nature and are demanded for the general upkeep of the entire building even though the part of the building repaired is included in the space used by a specific department. It was found that the repairs made in this case were of a general nature, and they have, therefore, been allocated to the respective departments in proportion to their use of the building as indicated by the number of square feet in each department. The basis of distributing these general repairs is the same as was used to apportion the building depreciation in Item 5. The computation is shown as follows:

DEPARTMENT	SQ. FT. USED	BUILDING REPAIRS
A	2,000	$20
B	2,000	20
C	4,000	40
Total	8,000	$80

18. Repairs—Machinery. Separate accounts are kept for the machinery repairs in each department. The charges on the statement against the respective departments are taken from

corresponding ledger accounts and the amount entered in the total column is merely a cross-footing of the three accounts.

19. Power. The charges to this account represent the cost of electricity for operating the machines. As only one meter was provided for the entire factory, it was decided to distribute the cost of power on the basis of the horse-power hours of the machines operated. The operating hours of the machines were found by totaling the time of the machine operators. From the data on hand in connection with the machinery, the horse-power required to operate each machine was secured and the average of all machines was computed for the respective departments. The operating hours were multiplied by the average horse-power per machine to acquire the horse-power hours for distributing the cost of power, as follows:

DEPARTMENT	MACHINE HOURS	AVERAGE H.P. PER MACHINE	H.P. HOURS	COST OF POWER
A	2,000	5	10,000	$40
B	1,400	10	14,000	56
C	500	4	2,000	8
Total	3,900		26,000	$104

Dividing the cost of $104 by the 26,000 h.p. hours, the quotient of $.004 is multiplied by the horse-power hours of each department to determine its portion of the total charge.

20. Light. From a survey of each department it was found that the electricity for lighting purposes was used in approximately the proportion set forth in the following schedule:

DEPARTMENT	PERCENTAGE OF TOTAL	COST OF LIGHT
A	25	$12.50
B	25	12.50
C	50	25.00
Total	100	$50.00

21. Small Tools. The cost of the small tools used is charged to the account for the department in which they were used. The charges on the overhead statement against the departments are taken from the respective accounts in the ledger and the amount entered in the total column is a cross-footing of the individual charges.

22. Departmental Supplies. The cost of the departmental supplies used is charged to the account for the department in which they were used. The charges on the overhead statement against the departments are taken from the respective accounts in the ledger and the amount entered in the total column is a cross-footing of the individual charges.

23. General Supplies. The charges to this account are for supplies of a general nature used by the stock-keepers, truckers, janitors, and so forth, which are not entirely for one department but for the general operation of the entire factory. The total cost is also entered in the "General" column to be distributed with other items to the respective departments in proportion to their size as indicated by the actual direct hours of each.

24. Insurance—Employer's Liability. The charge to this account represents the monthly cost of premiums for insurance protecting the employer against accidents to his employees, and as it is based upon the amount of wages paid, it is prorated in proportion to the departmental payroll, as shown below:

DEPARTMENT	PAYROLL	PERCENTAGE OF TOTAL PAYROLL	INSURANCE
A	$1,700	34	$20.40
B	1,300	26	15.60
C	2,000	40	24.00
Total	$5,000	100	$60.00

25. Transportation on Incoming Materials. All transportation charges on incoming materials, which materially affect the unit cost of the materials, are charged to the Stores account and added to the unit cost of the material. The charge to this account represents an aggregate of minor items which would amount to only a small fraction of the cost per unit of the materials received and have therefore not been added to the unit cost. It is entered in the "General" column to be distributed in proportion to the departmental activities as indicated by the actual direct hours.

26. Materials Spoiled and Scrapped. It was found that the cause of the spoiled materials which were charged to this account was of a general nature and not rightfully chargeable entirely to the department in which the cause originated, and therefore the amount is entered in the "General" column to be distributed in proportion to the size of the departments as indicated by the actual direct hours.

27. Stationery—Factory. 28. Drafting Supplies. The charges to these two accounts are entered in the "General" column to be distributed to the respective departments in proportion to their size as indicated by the actual direct hours.

29. Miscellaneous Expenses. Four accounts were kept for miscellaneous expenses—one for each of the three departments, and one for charges of a general nature to be borne by all departments. The amount entered in the total column on the overhead statement represents a cross-footing of the charges to the four accounts. The charge to the General Miscellaneous Expense account is entered in the "General" column to be distributed to the respective departments in proportion to their size as indicated by the actual direct hours.

30. Distribution of General Expenses. In order to reduce the computations required to prepare the overhead statement, the items to be distributed on the basis of the actual direct

hours are entered in the "General" column and one proration is made of the total as follows:

DEPARTMENT	ACTUAL DIRECT HOURS	GENERAL EXPENSES
A	2,500	$250
B	1,500	150
C	4,000	400
Total	8,000	$800

The actual direct hours shown above were taken from the payroll distribution for the month.

33. Total Overhead. The total of all of the overhead expenses for the entire factory, amounting to $4,830, is shown on this line with the total amount allocated to each department. This represents the actual expenses according to the books and records.

34. Overhead Distributed to Costs. The overhead added to the direct costs of the work performed in each department is figured on the basis of the actual direct hours at the average rates determined for operating the departments at their normal capacity. The figures on this line represent the total of the entries to the cost sheets for overhead on the work performed during the month. It is proved with the product of the total actual direct hours and departmental hourly overhead rates, as follows:

DEPARTMENT	ACTUAL DIRECT HOURS	OVERHEAD RATE PER HOUR	OVERHEAD DISTRIBUTED
A	2,500	$.55	$1,375
B	1,500	.80	1,200
C	4,000	.45	1,800
Total	8,000		$4,375

35. Balance Undistributed. This represents the difference between the actual overhead and the overhead added to the

direct costs of the work performed in the departments, which was figured at the average rates predetermined for normal operations. In view of the fact that the factory was not operating at its normal capacity, the amount undistributed should be deducted from the profits for the period. If the actual overhead (Item 33) had been distributed to the cost of the work performed, and if all of the work of the current month was on hand at the close of the month, it is apparent that the inventory accounts would be increased by the amount shown on the statement as undistributed overhead (Item 35). As a matter of fact, the product made when the factory is partially idle is worth no more than that which is made when running at normal capacity; and there is no excuse for concealing a loss due to idleness, in the inventory figures among the current assets. The undistributed overhead was due to the fact that the equipment and facilities of the factory were not utilized the full operating period in the month, and therefore the undistributed overhead becomes a loss of the month chargeable against the profits of the month.

36. Normal Direct Hours. The full number of employees that may be employed in each department was multiplied by the total working hours per month for each and the result was reduced to allow for normal inefficiencies. The balance is shown here as the normal direct hours.

37. Actual Direct Hours. The actual direct hours were obtained from the time tickets of the employees, which were chargeable to the productive work performed in the respective departments.

38. Fixed Expense per Hour—Actual. The fixed expense per actual direct hour was found by dividing the total fixed expenses (Item 32) by the actual direct hours (Item 37). The figure is used only as a barometer for statistical purposes to show the deviation per hour from the normal cost.

39. Fixed Expense per Hour—Normal. The fixed expense per normal direct hour was found by dividing the total fixed expenses (Item 32) by the normal direct hours (Item 36) and was used to figure the normal overhead for the month. The excess of the cost of fixed expenses per actual operating hour over the cost per normal operating hour represents the loss per operating hour due to a subnormal volume of work.

40. Producing Expense per Hour—Actual. The cost of the producing expense per actual direct hour was found by dividing the total producing expenses (Item 31) by the actual direct hours (Item 37). The result should remain approximately constant as each of the expenses classified as producing will fluctuate with the volume of work performed and will therefore vary in total but remain almost constant in the cost per actual direct hour.

41. Total Overhead per Hour—Normal Basis. The total overhead per hour figured on the normal basis for the month is found by adding the cost per normal direct hour of fixed expense (Item 39) to the cost per actual hour of producing expense (Item 40).

42. Average Rates Used. The average rates used were found from long experience to be the overhead per actual direct hour, computed upon a normal operating basis and averaged to eliminate the fluctuations erroneously shown in monthly statements.

CHAPTER XIII

THE PROFIT AND LOSS STATEMENT

Value of Cost Figures

The primary function of any cost system is to present an analysis of the operations of an entire organization in such a manner that the final composite results may be traced to the original causes or individuals responsible for their existence. The condensed results are presented to the general manager periodically, usually monthly, in the form of a profit and loss statement. If all the results shown thereon are normal there will be no cause for investigation, but if the results are not as anticipated the system should be so arranged that each of the condensed items shown on the profit and loss statement may be analyzed in detail so as to reveal all possibilities of betterment and to direct the administration in its efforts for greater profits through the correction of faults, even though these faults have originated with the individual in the factory performing the very first operation in the manufacture of the product.

The value of all cost figures is in their use. The mere accumulation of them is not corrective. They only point out the errors, and if the organization does not have the energy to strengthen the weaknesses uncovered or published by the cost figures it is useless to obtain them.

Upon being presented with a profit and loss statement the general manager will look first at the net result, which is the last item shown on the statement, and he will then view the items, in their reverse order, from the net profit to the sales, so that he may get a perspective of all operations from which

he can determine the points requiring a detailed investigation. A simple profit and loss statement is shown in a condensed form in Figure 2, and is followed with a short discussion of each of the items appearing thereon in the natural sequence in which they would be reviewed by the manager.

PROFIT AND LOSS STATEMENT
For the Month of January

	AMOUNTS		% OF SALES	% OF MFG. COSTS
NET SALES		$100,000.00	100	200
DEDUCT COST OF SALES:				
Manufacturing Costs	$50,000.00		50	100
Unabsorbed Overhead	1,000.00		1	2
		51,000.00	51	102
GROSS PROFIT FROM SALES		$49,000.00	49	98
DEDUCT COMMERCIAL EXPENSES:				
Selling Expenses:				
Advertising Department	$10,000.00		10	20
Sales Office	5,000.00		5	10
Salesmen	15,000.00		15	30
Total	$30,000.00		30	60
Delivery Expenses	5,000.00		5	10
Administrative and Office Expenses	10,000.00		10	20
Total		45,000.00	45	90
NET PROFIT FROM ABOVE OPERATIONS		$4,000.00	4	8
OTHER REVENUES:				
Interest and Discounts Earned	$2,000.00			
DEDUCTIONS FROM OTHER REVENUES				
Interest on Items Payable and Discounts Allowed	1,000.00			
Net		1,000.00	1	2
NET PROFIT FOR THE MONTH		$5,000.00	5	10

FIGURE 2.—Monthly Profit and Loss Statement

Percentages in Profit and Loss Statement

Averaging the total results for the month, it will be seen from the column headed "per cent of Mfg. Costs" on the statement that per dollar expended to manufacture the product which was sold during the month, the unabsorbed overhead amounted to $.02 and the commercial expenses were $.90,

allowing a net profit from the sales of $.08, and by adding the net revenue of $.02 from interest and discount, the net profit from all sources was $.10. Summarizing the averages per dollar as stated above, they may be shown for all items on the profit and loss statement as follows:

Manufacturing Costs of Product Sold		$1.00
Unabsorbed Overhead		.02
Selling Expenses:		
Advertising Department	$ .20	
Sales Office	.10	
Salesmen	.30	
Total Selling Expenses	$ .60	
Delivery Expenses	.10	
Administrative and Office Expenses	.20	
Total Commercial Expenses		.90
Total Costs, Delivered		$1.92
Net Profit		.08
Selling Price per Dollar Expended in Manufacturing Costs of the Product Sold		$2.00

There are many who erroneously apply percentages of sales to the cost of sales when figuring the minimum at which an article may be sold without loss, and for their benefit it is advisable to illustrate in some form similar to the foregoing "the cost of the product sold" as a base to which the other items may be added. They will then readily see the difference between the percentages of sales and of costs. In the instant case the commercial expenses are 45 per cent of the sales, and to add them to the manufacturing costs to determine a minimum selling price would be fatal, for it is clearly shown that an article costing $1 to manufacture must be sold for $1.90 in order to cover the normal expenses without profit; and if the cost is $2, it must be sold for $3.80, and so forth.

Percentage of Expense to Sales and Cost of Sales

The percentages which the expenses are of the sales, or the cost of the sales, should not be considered as infallible barometers for comparing one period with another. The activities represented by the figures should be considered as well as the amounts expended, and their relation to all of the other items concerned. A comparison of percentages alone is not sufficient and may be misleading if the base on which they are figured is changed in amount by reasons not affecting other items. If the percentages are figured on the cost of sales and a reduction or increase is made in the cost of manufacturing the articles sold, while the commercial expenses remain the same in amount, the expense percentages are naturally changed in the period in which the reduction or increase in the costs was first effective. This is more simply illustrated by the following statements:

		PERCENTAGE OF COST OF SALES
Cost of Sales	$1,000	100
Selling Expenses	500	50
Administrative Expenses	500	50
Total	$2,000	200
Net Profit	500	50
Sales	$2,500	250

Assuming that the volume of sales and the unit selling price remained the same in the next period, but that due to some invention a reduction of 50 per cent was effected in the cost of sales, the results would be as follows:

		PERCENTAGE OF COST OF SALES
Cost of Sales	$500	100
Selling Expenses	500	100
Administrative Expenses	500	100
Total	$1,500	300
Net Profit	1,000	200
Sales	$2,500	500

The selling and administrative expenses remained the same in amount in both periods but their percentages were increased from 50 per cent in the first period to 100 per cent in the second period, while the activities in both departments were productive of the same results at the same costs in both periods. As the sales remained constant, the selling and administrative expenses were each 20 per cent of the sales in both periods, but as illustrated with the cost of sales, any increase or decrease in the selling prices would also have been reflected in these percentages.

The error of using only percentages as a standard to judge the operations of a department is apparent in an extreme illustration like the foregoing, but unjust criticism of departmental managers often results from a misunderstanding of these simple principles.

Other Revenues

Referring again to the sample profit and loss statement, after discovering the net profit to be $5,000, each of the items contributing to it are carefully scrutinized. The next caption above the "Net Profit for the Month" on the statement is "Other Revenues," extended at a net amount of $1,000. Under this heading revenues and expenses are listed that may be called "nonoperating." They include such items as interest and cash discounts which are dependent upon financial conditions, and also income from sources somewhat foreign to the main purpose of the business, such as profits from "outside" investments. Expenses of a similar nature and costs incurred producing such revenues are deducted therefrom. As the accounts for such revenues and the deductions therefrom are so few in number, they are usually itemized on the profit and loss statement in accordance with the accounts kept. Trade discounts allowed are always treated as a deduction from the sales, and the net amount only is entered on the profit and loss statement. Like-

wise, trade discounts on purchases are deducted from the gross price and only the net amount is entered on the books. They are merely a means of establishing the net price from a standard base. Cash discounts, on the other hand, are offered as an extra inducement for prompt payment and are not a positive deduction, but may or may not be taken at the option of the payer. They are not realized or deducted until payment is made.

Commercial Expenses

The next extension is $45,000 for commercial expenses. In the instant case they have been divided into three main groups, namely, selling, delivery, and office and administrative expenses. The selling expenses have been further subdivided to segregate the expenses of the advertising department, sales office, and salesmen. The respective headings are indicative of the nature of the items classified thereunder. They are not standardized but are chosen to meet the requirements of each business. The total of each division should be supported by a detailed schedule, and any extraordinary charge included in the accounts itemizing the totals on the profit and loss statement should be explained in a footnote on the schedule on which the account appears.

There should be provided a group of accounts for each of the commercial departments so that the expenses of each department may be separately set forth in the schedules referred to, and the responsibility for their existence properly placed. Any general accounts into which expenses for all departments might be charged should be avoided. In charting the commercial expenses, the first requisite is to isolate each of the distinctive departments and then to adopt accounts for each as a unit.

Cost of Sales

Continuing upwards on the profit and loss statement, the next item extended, amounting to $51,000, is the cost of sales,

which includes the normal manufacturing costs of the product sold, amounting to $50,000, and unabsorbed overhead of $1,000. When the volume of production is below normal the overhead distributed to the manufacturing operations at normal rates will not absorb the actual overhead expenses, and the amount unabsorbed represents the cost of idleness or abnormal expenses of some peculiar origin. Only normal overhead is included in the factory cost figures, and any excessive overhead is charged off so as to avoid an erroneous inflation of the inventory figures.

Unabsorbed Overhead

There are some who believe that the exact overhead during a period should be absorbed or distributed to the cost of the production of the same period, but this not only delays all cost computations and the preparation of monthly statements, but also results in the factory costs being affected by conditions which are not always created or caused by the factory executives. If the sales department does not maintain its quota, and as a result the factory production must be reduced below normal, the overhead rates will be increased, and if such rates are blindly used in figuring the unit costs of manufacturing the product, they unjustly reflect against the factory executives, who, if making a standard product, would soon protect themselves by maintaining the greatest output possible, regardless of the quantity on hand unsold, the market conditions, or the financial effect upon the business.

A cost system should be a practical guide to the factory executives. There is nothing which will discourage its use more than to find, as a result of an extensive analysis made to discover the cause of a difference between the unit cost of a job just finished and a similar job previously completed, that it was due to the use of overhead rates which varied through faults beyond control of the factory executives. If the rates

are based upon the normal volume of production, any fluctuation in costs will then be due to the direct items of cost and the responsibility for their existence will be entirely upon the manufacturing departments. It is advisable to avoid anything in the operation of a cost system that will tend to discourage its use by the factory employees and executives for whose practical service it has been devised.

Overhead and Inventory Values

The effect on inventory values should also be considered in the use of overhead rates figured on varying volumes of production. Under normal conditions all factory expenses properly become a part of the cost of the product, but under other conditions the amount of money so expended may have a double purpose. There are certain fixed expenses that cannot be varied in proportion to the output of a factory, and therefore during times when the production is below normal they cannot be reduced. If the overhead is figured at hourly rates the total payroll hours of the productive employees required to operate a department at its full capacity, adjusted to allow for ordinary inefficiencies, are used to determine the normal production. If the capacity of a department permits the employment of 50 employees and the total payroll hours of each is 200 hours per month, the productive capacity of the department would be considered to be 10,000 hours. Estimating a reduction of 20 per cent from the full capacity of the department to allow for delays and other inefficiencies, its normal productive operations, or normal capacity, would be considered to be 8,000 hours. If the actual direct hours chargeable against all of the jobs worked on during a month in the department were only 6,000 hours, it naturally follows that the facilities of the department were not used to their normal capacity but were idle for a total of 2,000 productive hours. The fixed expenses continuing during the period of idleness should not be charged to the costs

of manufacturing the product, for such a procedure would produce untrue inventory values and be misleading in establishing selling prices. If high costs are due to idleness the cause should be known, for otherwise an increase in selling prices might be made at an inopportune time.

Production costs should include only the portion of manufacturing expenses which accrue during the time consumed in manufacturing the product. The normal production should not be figured as 100 per cent of the capacity of the factory, but should be determined from experience. It may be expressed by the volume of production or in the aggregate hours of the employees, or the machines required to operate the factory at its determined normal capacity. Any decrease in the production caused by idleness reduces the amount of overhead absorbed and that portion which is unabsorbed should be charged off monthly. It would be ridiculous to accumulate the depreciation and all the other fixed expenses of a department which had been idle for an entire month, and charge the total of its expenses for the two months against the operating costs of the second month during which it ran at its normal capacity. If such costs were pyramided for eleven months, and during the twelfth month the department operated at normal capacity and its output was on hand at the close of that month, it would certainly not be correct to inventory its product at a figure which would include the overhead for twelve months while it operated only one month. If the department had not operated at any time during the fiscal accounting period, its entire overhead would be charged to the Profit and Loss account when the books were closed. The moment of time does not alter the situation in the least, and if the principle is correct at closing periods, the cost of all idle equipment at all times should be charged directly against profits and not taken into the inventory through its distribution to the unit costs of the product manufactured.

Overhead Distributed Account

An account called "Overhead Distributed" should be carried on the books, which should be charged with the total of the manufacturing expenses and credited with the amount of overhead distributed to the cost records. During subnormal times the balance will represent the unabsorbed overhead, for which the factory executives or the sales department may be responsible. If the idleness of equipment is due to the lack of materials, the factory executives would be responsible; but if the sales department has not maintained its quota of sales and it becomes necessary for the factory to reduce its production, the sales department would be responsible. If this method of eliminating overhead on idle equipment is pursued, the causes for fluctuation in the cost records are confined entirely to the factory employees and the cost records are therefore more valuable in comparing results of one period with another.

Manufacturing Costs

The manufacturing costs of $50,000 is the next item on the profit and loss statement, and it represents the factory cost of the product which was sold during the month, as figured by the cost department. The cost figures, by the elimination of overhead on idle equipment or the gain in overhead during periods of abnormal production, seldom require analysis when appearing on a profit and loss statement, for the reason that each of the items of cost receives daily consideration. The results from the operation of a cost system during the first few months are of little value, for in nearly every case the inventory prices of processed materials have to be estimated and any errors made would affect the cost of articles subsequently completed from materials priced in error. After the system has been in operation for a reasonable period, standard costs should be determined from experience for the various operations performed in the factory, and should be reduced to a unit from

which the posting clerk, when posting labor, can see at a glance if the standard is maintained. Any consequential fluctuation should be reported to the superintendent who in turn will have the matter taken up for correction with the employees directly responsible. As most of the fluctuations in costs are due to labor, it should be constantly watched so that corrections may be made before the work is totally completed. The fault may be with the tools or the employee, but in either case it can be corrected so that the standard may be maintained.

The manufacturing cost of the product sold should be classified according to the requirements in each particular case to correspond with the classification adopted for the sales. The records should be so arranged that, if necessary, the cost of sales entry may be traced to all of the original elements of costs. That is, if an assembled article is made, references on all cost postings should indicate the derivation of all figures. It should be possible to trace the cost of sales entry to the finished stock cards and then to the assembly cost sheets, from which the finished parts used may be traced through the stock cards to the cost sheets for their manufacture.

Sales

The sales of $100,000, as shown on the profit and loss statement, should be supported by schedules classified and perhaps reclassified according to the requirement or requirements of the business. A distribution of the sales made by each salesman showing the amount of the various classes of product sold and segregated by territories, will in many cases be a valuable aid to the sales executives in directing the salesmen. Whatever classification is found to be valuable can easily be summarized if properly arranged.

Advantages of a Cost System

In addition to the foregoing advantages accruing from a cost system through its monthly statements, there are many

direct benefits in the operation of the factory. It demands a systematic arrangement of the stock, which will be productive of income through the saving effected. It reduces the capital required to operate a business through the establishment of stock requirements which are maintained in conjunction with the stock record. It increases the output by concentrating the efforts of skilled labor on production and eliminating the use of skilled labor for nonproductive work. It reduces costs through the establishment and maintenance of standards, and through its comparative records, it properly places the employees in the work for which they are most fitted and in which therefore they will be most contented. It eliminates cost estimates in establishing selling prices.

Establishing Selling Prices

Very often when a cost system is introduced, the attempt is made to establish all sales prices upon a basis of cost plus a fixed percentage to be added for profit. If business could be operated by so simple a rule, there would probably be more successful men. Of course, the purpose of conducting any business is to make a profit, but the result cannot be obtained by stubbornly adding an amount for profit to costs of the moment in establishing selling prices. It is first necessary to reduce the costs to a normal figure before using them as a base from which the selling prices may be computed. When the actual costs are less than normal, due to extraordinary efficiencies or an abnormal volume of production, the saving should be added to the profits and not given to the customers through reductions in sales prices. Conversely, competition will not permit goods to be sold at a profit when they cost an abnormal amount to manufacture due to inefficiencies and a subnormal volume of production. The first requisite in making a profit from manufacturing operations is to bring the production to a volume equal to the normal capacity of the factory.

Selling prices should be established only after consideration is given to all factors relating thereto. The existing supply and demand should be studied. There are times when prompt delivery is of more importance than price. Particular attention should also be given to the appearance of the article from the buyers' viewpoint. This is particularly true in establishing selling prices for repair parts for the finished product. The buyers may not realize the difficulties encountered in manufacturing an article, and even if its selling price includes only a nominal profit over normal costs, they may become dissatisfied and lost as customers. On the other hand, they may not be aware of the ease with which another part may be made and may be perfectly willing to pay a high percentage of profit.

Minimum Selling Price

In establishing selling prices it is often desirable to know the minimum figure at which an article may be sold without a loss or at a small profit. The cost is always known and is therefore the base of the computation. However, there are often cases in which the allocation of the advertising and sales expenses to unit articles can be most equitably accomplished through a percentage of the selling price. When it is desired to figure at what price an article must be sold to produce a certain profit when the percentages to be used relate to the cost of the article in one case and the selling price in another, the computation may be simplified by adding all of the percentages together, regardless of whether they had been figured on costs or on sales, and dividing the result by the complement of the total of the percentages based upon sales (1.00 minus the percentages based upon sales). This may be illustrated by the following example:

What percentage should be added to the cost in order to make a profit equal to 4 per cent of the *selling price* when the administrative expenses are equal to 7½ per cent of the *cost*

and the sales expenses are equal to 10 per cent of the *selling price?* The total percentage on sales is .14 and the complement, or 1.00 minus .14, equals .86. The total of all percentages equals .21½, and dividing this figure by .86 gives .25, or the percentage to be added to the cost to determine the selling prices.

CHAPTER XIV

THE CAUSE AND EFFECT OF UNABSORBED OVERHEAD

Providing for Lean Years in Periods of Prosperity

As the expenses of a manufacturing business and the volume of production cannot be maintained in a constant ratio, the expense costs per unit of the product will fluctuate inversely with the volume of production. As the volume of business increases above normal, the expense costs per unit of the product manufactured will decrease. Conversely, the unit expense costs will increase as the volume of business decreases.

It is a well-established fact that business as a whole operates in cycles. Periods of prosperity are offset or equalized by periods of depression. One follows the other, and it is certain that after every period of prosperity there will come a period of depression. It is, therefore, imperative for every factory to protect its interests and provide for its maintenance through the periods of depression by being extremely diligent in the administration of its affairs during the periods of prosperity.

When there is plenty of business for all, selling prices are high, expense costs are low, and profits should be large; deliveries become more important than the price, and buyers compete with each other, while the seller automatically profits. It is then that an abnormal profit should be made to provide for the lean years to follow. But in many cases the enormous profits which should accrue in prosperous time are dissipated in extravagances and inefficiencies.

It is deplorable that so many executives of manufacturing

businesses take the entire credit for the profits made when business is above normal, and figuring that under their guidance a profit can always be made, they distribute the entire earnings, or recklessly increase the capacity of their plant without consideration of the normal demands. Then when business is bad they absolve themselves from all personal blame for their precarious condition and idly hope for a change to relieve them of their difficulties and for profits again to be forced upon them through competition of buyers.

Importance of Maintaining Volume of Production in Depressions

Every period of prosperity creates a depression. It arouses owners of capital. The profit of every business is envied and draws competition. Factories are built without regard for the existing source of supply for the product to be manufactured, and everyone profits. But when the depression starts, only the most fit can survive; and those who are the first to readjust their prices and keep their volume of production up to the point where it will absorb their fixed expenses at normal rates, profit the most. No one individual can control the business conditions of a country, but every individual is responsible for the extent to which he is affected by conditions. During the year 1921, when the total volume of the business in the country was less than that of the year 1920 and far below 100 per cent of the capacity of all factories, the production of numerous factories ranged from 10 per cent to 250 per cent of their volume for 1920.

In one case a manufacturer who felt well fortified with a large bank balance on January first, decided to take only the "profitable business" and trust that his competitors would bankrupt themselves with the "unprofitable business." At the end of six months not only was his bank balance gone but he was rapidly becoming a heavy borrower. He could not understand

why he had suffered a big loss when every job he had taken was at a higher price than the peak prices of the previous year, when he had made a profit. The answer was reflected in the volume of his production, which amounted to 10 per cent of the volume for the same period in the previous year.

Fixed Overhead and Volume of Production

Operating a factory without a loss during a period of depression is more creditable than making a normal profit in prosperous times. It requires a keen study and understanding of all the operating elements of the business and a clear vision of the effect of each upon the others under varying conditions. The first object to strive for in the operation of any factory is a normal volume of production. When production is completely stopped it results in the loss of the entire fixed overhead. A 50 per cent production results in a loss of 50 per cent of the fixed overhead, and even though a profit was anticipated from the sales such profit possibly may not offset the loss of 50 per cent of the fixed overhead. Therefore, during periods of business depression it is paramount to restore the production to the normal capacity of the factory, and for this purpose it may be necessary to take orders without profit on the basis of normal costs, for it is financially better to aim to break even than to have an unexpected loss occasioned by subnormal production. After the production of a factory is restored to normal, a profit may be demanded upon subsequent business.

The cost accountant has the best opportunity to appreciate the effect upon the operating results of a factory caused by a deviation from the normal volume of production. The cost figures show the effect of each month's operations, and if analyzed, the cause of any fluctuation between the results of one month and another may be easily traced. While analyzing past operations does not rectify the errors or change the results, it should protect the future against a repetition of mistakes.

Determining Cost of Actual Manufacture of Product

It seems to be generally agreed that the factory cost of manufacturing an article should include the cost of direct materials, direct labor, direct expense, and a portion of the factory overhead expenses. The direct costs are simple and easily comprehended by all, but the item of overhead is more complex, especially in determining the exact measure of that "portion."

There is no accounting principle which justifies the inclusion of the entire expenses of a factory in the costs of manufacturing its products for inventory or other purposes, merely because they are classified under the broad head of "manufacturing expenses." The very purpose of segregating the manufacturing expenses separately from the commercial expenses of a business is to exclude from the manufacturing costs such items of expense as are not really a cost of the actual creation or production of the product. Under normal conditions all manufacturing expenses may be truly applicable to the cost of manufacturing the product, but the periods of normalcy are short. We are more often existing in periods which are abnormal or subnormal, and, therefore, a further subdivision of the manufacturing expenses is required in order to determine the amount of overhead to be added to the direct costs of the actual operations performed.

Fixed and Producing Expenses

As stated in Chapters VIII and IX, there are two kinds of manufacturing expenses: first, there are the expenses which are contracted for a period of time and continue unaffected in amount by a deviation from the normal volume of production, such as insurance, taxes, depreciation, rent, salaries of superintendent and foremen, and other expenses of a like nature; and second, there are the expenses which may be measured by the volume of production and have a more direct relation to the manufacture of the product, such as power, small tools, supplies,

repairs and all other expenses which do not remain fixed in amount. The first group may be called "fixed expenses"; and the second group, "producing expenses."

All the producing expenses should be absorbed as a cost of producing or manufacturing the product. The distributing rate should be as constant as possible, using an average which will absorb a total during the fiscal year equal to the actual amount of the producing expenses.

Considering the fact that the fixed expenses are a definite amount per month, they may also be considered to be a definite amount per working hour or fraction thereof. If a factory were entirely closed for the period of a full year and its only expenses were depreciation, taxes, insurance, wages of watchmen, and possibly the salary of the superintendent and a few others who were paid merely to retain them in the organization, no criticism would be made if the entire amount of such fixed expenses were charged against the profit and loss account at the close of said year. If such a procedure is sanctioned when it covers a period of an entire year, it certainly cannot be condemned when applied to a shorter period.

Basis of Fixed Expense Distribution

The fixed expenses have furnished the factory the facilities for obtaining a certain volume of production. The capacity for the employment of labor is also fixed, and the ratio of the labor employed to the normal capacity offers the most convenient means of measuring the extent to which the facilities of the factory are used. In the machine departments the machine operating hours may be used.

When the employment of labor for a month is below normal, it indicates that the facilities of the factory were not used to their normal extent. When the cost of using the factory facilities is reduced to a unit per normal operating hour and used as a basis for distributing the fixed expenses to the cost

of work performed, the full quota of labor must be employed in order to absorb the entire amount of the expenses. By distributing the fixed expenses upon the basis of the cost per normal operating hour, the work performed is charged with the cost of using the factory facilities only for the portion of time during which they were actually used. The expenses accruing during the periods in which the facilities were unused is not averaged in the charge against work performed, but it remains unabsorbed and shows the management the loss resulting therefrom.

Effect on Inventory and Comparative Cost Records

Further justification for including in the cost of manufacturing the product only the expenses for the period in which the processing occurred may be found when the profits and the asset value of the inventory of processed materials are considered. If an abnormally large amount of overhead due to a subnormal volume of production, is added to the direct costs to determine the inventory value of the processed materials on hand, the total may even exceed the selling price and certainly would not reflect a true value to a going business. In addition to misrepresenting the value of the current assets, the net profit or loss would also be erroneous. In the case of a new factory which has not attained a volume of production equal to its normal capacity, if it is desired to carry some of the manufacturing expenses as a charge against future profits, there is still no justification for concealing it in the inventory figures.

If the actual monthly overhead is used in figuring costs regardless of the normal amount, the use of the comparative cost records would be practically destroyed. An investigation of fluctuating costs would show the cause most frequently to be in the overhead, and as the responsibility for the overhead rates in such cases is a source of argument, further investigations would be avoided. If normal rates are used, a substantial

fluctuation in the total cost of an article made, compared with that which was made at the same material and hourly labor costs prior thereto, would reflect upon the efficiency of the production departments.

Production Departments' Responsibility for Unabsorbed Overhead

Unabsorbed overhead may be due to several reasons. The production departments may be to blame, or the sales department, or the administrative department. If the factory officials are responsible for a subnormal employment of labor, the cause may be found:

1. In a poor system of purchasing the materials,
2. In a faulty production and planning system, or
3. In the treatment of the employees.

1. An inefficient purchasing department very often forces a factory to curtail its production on account of a complete exhaustion of certain of the materials which had not been anticipated in time to replenish the stock.

2. A faulty production and planning system frequently allows certain parts to be overlooked or not manufactured in a quantity proportionate to other parts for assembly requirements, and thereby disturbs the equilibrium of the factory while its production activities are centered upon the manufacture of these parts, and perhaps forces the work of some departments to be stopped entirely.

3. The treatment accorded to the employees may make the labor turnover large and make it practically impossible to maintain the full quota of employees.

Sales Department's Responsibility for Unabsorbed Overhead

Unabsorbed overhead may also be traced to the sales department when the volume of sales falls below that of the

normal production. It may be due to poor salesmanship or it may be claimed that the amount allowed for selling and advertising expenses is not large enough to produce the results necessary to bring the factory production to its normal basis. Also, the selling prices may be too high to meet competition, or if not affected by competition, the majority of prospective customers may consider them too high for their use of the product. If high selling prices curtail the demand upon the factory for production and destroy the anticipated profits, there are three factors to be investigated—the estimates per unit, when operating at normal capacity, of the margin of profit, of the commercial expenses, and of the factory costs. If the margin of profit is estimated so high that the selling price in which it is included prohibits sales, the estimate will never be realized. A decrease in the selling price by a reduction of the estimated profit would probably be effective in attaining the sales quota and the revised estimated profits. If the difficulty is due to extravagant expenditures by the sales or production departments, the remedy is apparent.

Administrative Department's Responsibility for Unabsorbed Overhead

When the selling price is right and the estimated profit per unit is fair but the quantity sold is below the requirements on account of the financial limit placed upon the sales department, it becomes necessary to reduce the factory costs and to transfer the saving thus made to the sales department to extend their activities. It is not presumed that the factory costs can be decreased in every case, but there are almost invariably numerous possibilities of accomplishing a reduction that are ignored until a critical situation arises. Factory operations produce a complex problem, and when a few of the operating factors are considered it is safe to assume that very few factories reach an efficiency of 100 per cent. There is opportunity for a possible

saving in the material specifications, the production of each individual employee, the production and planning system, the design of the articles manufactured, the operations and their sequence, the equipment and its placement, all expenditures, and the volume of production.

A change may not be an improvement, and the advisability of adopting a change can be determined only by definitely knowing the status of the situation before the change is made effective, and the probable subsequent results. This is one of the purposes of a cost system. It is not advisable to adopt blindly a radical change in selling prices without first analyzing the entire costs of the operations of the factory and to budget the possible results under various volumes of production. It may be found that certain concessions in selling prices can be granted to the sales department in return for an increase in the volume of sales, but it would be dangerous to grant such concessions without first preparing a budget of the anticipated business upon which they are to be granted and establishing therefrom a quota for the sales department to maintain. The results should then be compared with the budget daily.

Credit Balance in Unabsorbed Overhead Account

When the volume of production is abnormally high it will be found that the amount of overhead distributed at normal rates will exceed the actual amount of the manufacturing expenses. The resulting credit in the unabsorbed overhead account may be transferred to a surplus reserve to provide for future depressions, or it may be taken as an adjustment against the cost of sales. As the costs used in pricing the inventory would be higher than if the overhead rates had been based upon the actual expenses, in some cases there may be some justification for carrying a special reserve to be deducted from the inventory accounts on a financial report, to reduce the figures to costs based upon the actual overhead rates.

CHAPTER XV

THE EFFECT OF UNABSORBED OVERHEAD ILLUSTRATED

Folly of Increasing Prices in Time of Depression

In cases where the entire overhead is distributed and included in the cost of manufacturing the product of a factory regardless of the volume of production, the executives may be misled by the cost figures obtained during a period in which the volume of production is subnormal and may as a result make disastrous changes in selling prices. It frequently happens that selling prices are raised, as business declines, on account of "high costs." Invariably the high costs are occasioned by a subnormal use of the factory facilities, and by averaging the entire overhead under such conditions the charge for overhead per unit of the product becomes abnormally high. When the selling prices are raised to provide for a profit over the high costs, the profit is never realized, for the effect of raising selling prices at such times is to turn sales away, to decrease production, and to raise the costs again. The estimated profits become absorbed by the increase in the unit cost of the expenses, which were also estimated upon the basis of a larger volume. The whole situation appears to grow more hopeless as the depression continues, for in the attempt to avoid a loss the very policy adopted by the executives only increases it in the actual results.

Counteracting Sales Decline

It is not possible for every factory to maintain a normal production during the general depressions of business, but those

fully aware of the value of operating a factory at its normal capacity may possibly do so at the expense of others. There are some articles protected in some manner, as by patents, which are sold at such a price that a profit is always made regardless of business conditions, inefficiencies, and so forth. Ordinarily, however, the successful operation of a factory over a period of years requires a production from its equipment and facilities at all times equal to its full normal capacity.

A production equal to the full normal capacity of a factory may not necessarily be the average of the volume actually produced during a period of years, but it is the possible production that may be obtained from the full use of its facilities, after making allowances for normal inefficiencies. It is frequently found that the normal capacity of a factory is greatly in excess of its requirements to supply the demand for its product. Such mistakes cannot be made profitable, for if competition exists the consumer or buyer is not interested in the manufacturer's miscalculations in regard to his production requirements as long as others offer the same goods at less money and still appear to make a profit. The only salvation for manufacturers with an excessive amount of equipment is more production, and if necessary, the manufacture of new lines should be investigated and taken on.

In periods of prosperity new factories are built, and in spite of the added competition the demand is so great that selling prices increase and profits are abnormally large. In the depression that follows, the losses are frequently so terrific that the net result for the two periods may even be a loss. Therefore, when a decline in sales indicates that the production must be reduced, every effort should be made to counteract it; every inducement should be offered for added business. The first to reduce selling prices is the one who profits most. The task is to get enough business to absorb expenses. Those who hold out for the high profits of prosperous times and wonder how

their competitors can make a reduction in their selling prices, seldom survive the financial strain of a business depression.

Allocation of Overhead in Contract Shops

Contract shops, manufacturing articles, or performing operations according to the specifications of their customers, are perhaps the most vitally affected by an incorrect allocation of overhead. The cost for almost every order taken must be estimated and the sales price established therefrom before the work is started. In cases where a complete cost system is not in operation, it is often found that the adopted custom in establishing selling prices is to add a fixed percentage for profit to the estimated costs which include overhead figured in proportion to the direct labor. The percentage of overhead used in the estimates is changed each month, in such cases, to correspond with the actual rate for the preceding month. When a depression starts, the rates increase and the bids for new work are made higher and higher each month. It is then that the management cannot understand how their competitors can bid so low in a period of high costs. Finally, they must resort to the tactics of their competitors, and in order to be certain of the results, they should prepare a budget of expenses in which all of the extravagances of abnormal prosperity should be eliminated and new rates of overhead should be figured, based upon the full employment of labor which would be required to operate the plant at its normal capacity. Gradually the effect of the new rates will be seen in the sales and the volume of production, and the loss from unabsorbed overhead will be stopped.

Causes of Cost Variations When Normal Overhead Rates Are Used

When normal overhead rates are used the variations in the cost of manufacturing an article in one period and a like article in another period are caused by fluctuations in:

1. The purchase price of materials.
2. The amount of waste in the materials used.
3. The wages of employees.
4. The speed or efficiency of the employees.

The effect of each of the above causes may be traced to the exact item by comparison of the cost sheets for the two periods. The underdistributed or overdistributed overhead and the commercial expenses do not ordinarily appear upon the cost sheets, and their effect upon the net profits presents an entirely different problem.

Direct and Fixed Commercial Expenses

The commercial expenses, like the manufacturing overhead, contain certain expenses that are fixed, and also other expenses that vary in proportion to the sales and are incurred more directly for the acquisition and delivery of customers' orders. The direct expenses are a cost of the business actually done, while the fixed expenses are a cost of the normal amount of business that should be done. The rates between the fixed commercial expenses and the total selling price of the normal production of the factory should be determined and used as a basis for allocating the amount of the fixed commercial expenses to the cost of the actual sales made. The balance unabsorbed by the sales represents the loss due to a subnormal volume of business. While this treatment of commercial expenses has no effect upon the final net profit from operations, it is necessary in order to determine the cost of the product made and delivered.

Effects of Deviation from Normal Operations Illustrated—Conditions Assumed

The results produced by a deviation from normal operations are illustrated in the statements given in the following pages, which have been purposely made simple so as to create no confusion from unnecessary details. In reality the cost of produc-

ing expenses per operating hour and direct commercial expenses per article sold will differ from month to month, but as the variation is very slight it is ignored for the sake of simplicity in the cases given.

The statements are based upon the premise that:

1. The machine hour method was used to figure the costs and that there was one machine, unlike all others, for which the operating and commercial costs were computed as a separate unit of the business.
2. The product of the machine was in the form of a completed article and required one hour for its manufacture.
3. The machine could be operated, under normal conditions, 200 hours per month.
4. The fixed overhead was $150 per month, and the producing overhead and operator's wages were $1 per operating hour.
5. The material used cost $.75 per article.
6. The selling, delivery, and office expenses under normal conditions were $50 per month, of which the fixed expenses amounted to $30, and the direct expenses amounted to $.10 per article.
7. The product was sold at a unit price of $3 and immediate shipments were made as soon as the manufacture was completed.

Results of Normal Operations

During a month of normal operations, the results were as follows:

(1)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	$ .75
Producing Overhead including Operator's Wages	200	1.00
Total (200 operating hours)	$350	$1.75

The statement of profits for the same month was as follows:

(2)	TOTAL FOR MONTH	AMOUNT PER ARTICLE
Sales (200 articles)	$600	$3.00
Cost of Sales:		
Materials Used	$150	$ .75
Labor and Overhead	350	1.75
Total Manufacturing Costs	$500	$2.50
Commercial Expenses:		
Fixed	30	.15
Direct	20	.10
Total Costs Delivered	550	2.75
Net Profit	$ 50	$ .25

Decline in Sales—Total Overhead Included in Factory Costs

During the next month the sales were less, and as a result the machine operated only 100 hours. The fixed overhead remained the same in total, and the producing overhead was reduced in total but remained the same cost per hour. The overhead totals were as follows:

(3)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	$1.50
Producing Overhead including Operator's Wages	100	1.00
Total (100 operating hours)	$250	$2.50

Commercial Expenses:	TOTAL FOR MONTH	AMOUNT PER ARTICLE
Fixed	$30	.30
Direct	10	.10
Total (100 articles)	$40	$ .40

Including the entire amount of the manufacturing expenses

as cost of the articles made, the statement of loss for the month was as follows:

(4)	TOTAL FOR MONTH	AMOUNT PER ARTICLE
Sales (100 articles)	$300	$3.00
Cost of Sales:		
Materials Used	$75	$ .75
Labor and Overhead	250	2.50
Total Manufacturing Costs	$325	$3.25
Commercial Expenses:		
Fixed	30	.30
Direct	10	.10
Total Costs Delivered	365	3.65
Net Loss	$ 65	$ .65

It will be seen from the foregoing that when the production was reduced from the normal of 200 articles to 100 articles, the labor and overhead total increased from $1.75 to $2.50 per article, and the net result was reduced from a profit of $50 to a loss of $65.

Two Periods Compared

By comparing the two statements it will be found that in both cases it required one hour for the manufacture of each article, and consequently, the labor cost and producing overhead were constant. The facilities of the factory were used the same length of time for the manufacture of each article in both cases: that is, one hour for each article. The efficiency of the factory during the actual operating time was identical in both cases. The only point of difference in the two cases is in the total time which the facilities were used. In the first case the machine was operated 200 hours; in the second case, 100 hours.

Briefly summarized, the operations of the two periods show that no change was made in:

1. The specifications of the product.

2. The purchase price of the material or the quantity used for each article.
3. The wages of the employees or the time consumed to complete each article.
4. The hourly cost of producing overhead.
5. The facilities of the factory or the time actually used for the manufacture of each article.

Maintaining Normal Rate of Production But Reducing Period of Operations

When confronted with the foregoing conditions, there is no justification for showing the cost of *manufacturing* the 100 articles in the second period to be $3.25 each, while all the factors pertaining directly to the production of each article were similar in the first period when 200 articles were made at a cost of $2.50 each.

If a semi-monthly accounting was made and all of the 100 articles completed during the second month were manufactured and sold in the first half of the month, the overhead shown in statement (3) would be distributed as follows:

(5)	1ST HALF	2ND HALF	TOTAL FOR MONTH
Fixed Overhead	$ 75	$75	$150
Producing Overhead including Operator's Wages	100		100
Totals	$175	$75	$250

As the 100 operating hours for the first half of the month were normal, the labor and overhead cost of the work performed amounted to $1.75 per hour. As there was no production during the last half of the month, the fixed expense accruing therein is a dead loss which cannot be recovered. The costs figured in the first half of the month would not be revised to include the overhead loss of the second half of the month. The unabsorbed overhead of the second half is a loss due to idleness and should not be averaged in the costs upon which

selling prices are based. Customers are willing to buy at a price which will include a profit in addition to all actual producing and marketing costs, but competition relieves them from buying at a price which includes charges for doing nothing. They are willing to allow for normal inefficiencies and delays, and provision should be made for that in determining the normal operating hours.

Proper Handling of Unabsorbed Overhead

If the fixed expenses accruing over a period of total idleness are a loss which cannot be recovered, it naturally follows that the fixed expenses accruing while the facilities are idle at intervals during the accounting period are a similar loss. Consequently, when there are intermittent periods within the accounting period in which the factory facilities are not used, the resultant loss should not be undisclosed, as in statements 3 and 4, but should be shown as follows:

(6)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	
Less Unabsorbed Overhead while Facilities were Idle (100/200 of $150)	75	
Fixed Overhead while Machine Operated	$75	$ .75
Producing Overhead including Operator's Wages	100	1.00
Total (100 operating hours)	$175	$1.75

Commercial Expenses:	TOTAL FOR MONTH	AMOUNT PER ARTICLE
Fixed	$30	
Less Unabsorbed (100/200 of $30)	15	
Balance Absorbed by Sales	$15	$ .15
Direct	10	.10
Total (100 articles)	$25	$ .25

The statement of loss should be shown as follows:

(7)	TOTAL FOR MONTH		AMOUNT PER ARTICLE	
Sales (100 articles)		$300		$3.00
Cost of Sales:				
Material Used	$ 75		$ .75	
Labor and Overhead	175		1.75	
Total Manufacturing Costs	$250		$2.50	
Commercial Expenses:				
Fixed	$ 15		$ .15	
Direct	10		.10	
Total Costs Delivered		275		2.75
Profit from above		$ 25		$ .25
Unabsorbed Fixed Overhead while Idle (Statement 6)	$ 75		$ .75	
Unabsorbed Fixed Commercial Expenses (Statement 6)	15		.15	
		90		.90
Loss for Month		$ 65		$ .65

Inclusion of Inventory Figures

Re-working the statement which was given in statement 4 into the form shown in statement 7, gives the same final result but that is only due to the fact that the statements have not been complicated with inventory figures. If it is assumed that the same conditions prevailed, except that only 50 articles were sold out of the 100 manufactured, the results if the entire overhead is absorbed would be as follows:

(8)	TOTAL FOR MONTH		AMOUNT PER ARTICLE	
Sales (50 articles)		$150.00		$3.00
Cost of Sales (100 articles manufactured):				
Material Used	$ 75.00		$ .75	

Labor and Overhead	250.00	2.50	
Total Cost of Manufacturing 100 Articles	$325.00	$3.25	
Less Cost of 50 Articles on Hand	162.50		
Cost of 50 Articles Sold	$162.50		
Commercial Expenses:			
Fixed	30.00	.60	
Direct	5.00	.10	
Total Costs Delivered		197.50	3.95
Loss		$ 47.50	$ .95

By not absorbing the loss of idleness in the cost of the product manufactured, the results would be as follows:

(9)	TOTAL FOR MONTH		AMOUNT PER ARTICLE
Sales (50 articles)		$150.00	$3.00
Cost of Sales (100 articles manufactured):			
Material Used	$ 75.00	$ .75	
Labor and Overhead	175.00	1.75	
Total Cost of Manufacturing 100 Articles	$250.00	$2.50	
Less Cost of 50 Articles on Hand	125.00		
Cost of 50 Articles Sold	$125.00		
Commercial Expenses:			
Fixed	7.50	.15	
Direct	5.00	.10	
Total Costs Delivered		137.50	2.75
Profit from above		$ 12.50	$ .25
Unabsorbed Fixed Overhead while Idle	$ 75.00	$1.50	
Unabsorbed Fixed Commercial Expenses	22.50	.45	
		97.50	1.95
Loss		$85.00	$1.70

By comparing the two foregoing statements, it will be seen that the loss is stated in the first as $47.50 while in the second it is shown as $85, making a difference of $37.50 which became absorbed in the inventory figure in the first statement. In this first statement, the loss and the cost value of the articles on hand are incorrectly shown, and as a consequence the same error would appear in the total of the current assets if a balance sheet were prepared.

The difference of $37.50 in the two inventory figures is in the same proportion to the total unabsorbed fixed overhead as the inventory is to the total production for the period.

Taking on Extra Work

The inventory figures are again dropped from the following illustrations for the sake of simplicity. It is now assumed that from the market conditions it was estimated rather definitely that only 100 articles would be sold, and therefore extra work was sought for the machine. If a contract was found for 100 hours of machine work at $1.70 per hour upon material to be furnished, it would appear from the previous example, when only 100 articles were sold and all overhead was absorbed in the costs (statement 4), that the labor and overhead cost of operating the machine was $2.50 per hour and such a contract would result in a loss of $.80 per hour or a total of $80. Everything would appear to indicate that the contract would be a poor one to accept and would result in increasing the loss from the $65 (shown on statement 4) to a total of $145.

If, however, normal costs were figured as in statement 7, where the labor and overhead costs are shown to be $1.75 per hour, it would appear correctly that such a contract would result in a loss of $.05 per hour or a total loss of $5. If the contract is not taken, a loss of $65 is inevitable (statement 7). If it is taken, the entire unabsorbed fixed overhead, amounting to $75, would be absorbed at a cost of $5, the direct loss from

the contract, making a net betterment in the final results of $70 and producing a profit of $5 instead of a loss of $65. The overhead statement would be as in statement (1) and the statement of profit would be as follows:

(10)

	TOTAL FOR MONTH		AMOUNT PER ARTICLE	
Sales (100 articles)		$300		$3.00
Cost of Sales:				
Material Used	$ 75		$ .75	
Labor and Overhead (100 hours)	175		1.75	
Total Manufacturing Costs	$250		$2.50	
Commercial Expenses:				
Fixed	15		.15	
Direct	10		.10	
Total Costs Delivered		275		2.75
Net Profit from above		$ 25		$ .25
Revenue from Special Work	$170			
Less Cost of Special Work:				
Labor and Overhead (100 hours)	175			
Loss from Special Work	$ 5			
Unabsorbed Fixed Commercial Expenses	15			
		20		
Net Profit		$ 5		

It will be seen from the foregoing that it may even be profitable at times to take on work at less than cost. It is better to absorb a part of the fixed expenses than none.

Factory Costs Reduced Below Normal

If sales dropped and it was decided to stop completely the production of the regular product for a month and to confine the activities of the factory to the completion of a new contract similar to the one previously cited, but requiring 250 hours to

complete, and the entire work was completed during the month, the results would be as follows:

(11)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150.00	
Add Overhead absorbed in Excess of Normal (50/200 of $150)	37.50	
Total Fixed Overhead Distributed to Costs	$187.50	$ .75
Producing Overhead including Operator's Wages	250.00	1.00
Total (250 operating hours)	$437.50	$1.75

The statement of profit would be as follows:

(12)	TOTAL FOR MONTH
Revenue from Special Work (250 hours at $1.70 per hour)	$425.00
Cost of Special Work: Labor and Overhead (250 hours)	437.50
Loss from above	$ 12.50
Overhead Distributed in Excess of Normal	37.50
Net Profit from which Commercial Expenses are to be deducted	$ 25.00

It is easily seen from the foregoing that the loss from the contract when figured at normal costs was more than offset by the reduction of the hourly costs below normal, due to the abnormal number of operating hours in the period. Disregarding normal costs, the overhead totals would be shown as follows:

(13)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	$ .60
Producing Overhead including Operator's Wages	250	1.00
Total (250 operating hours)	$400	$1.60

The above costs show that a profit of $.10 per hour was made on the contract price of $1.70 per hour. As there were 250 hours, the total profit would be $25, which agrees with the amount shown in statement 12. However, if inventories were inserted in the statements, the final results would differ, as has already been demonstrated.

Time Required for Labor Operations Reduced

Very frequently mistakes are made in estimating the effect of reducing the time required for labor operations when it is not planned to increase the volume of production. In the foregoing statements it has been shown that it required one hour for manufacturing the standard product of the machine under normal conditions, at a cost of $1.75 per article for labor and overhead. If the time required would be reduced one-fifth, or from one hour to 48 minutes per article, it would be presumed that without increasing the volume of production the saving thus made would increase the net profits. The previous labor and overhead costs of $1.75 per article would be reduced to $1.40 and the saving of $.35, or one-fifth of the previous costs, would be anticipated as profit. However, as the monthly production was not to be increased, possibly due to limitations placed thereon by the purchaser, it would require only 160 hours to manufacture the 200 articles and the results would be as follows:

(14)	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	
Less Unabsorbed Overhead while Facilities were Idle (40/200 of $150)	30	
Fixed Overhead while Machine Operated	$120	$ .75
Producing Overhead including Operator's Wages	160	1.00
Total (160 operating hours)	$280	$1.75

The statement of profits would be as follows:

(15)	TOTAL FOR MONTH	AMOUNT PER ARTICLE
Sales (200 articles)	$600	$3.00
Cost of Sales:		
Material Used	$150	$ .75
Labor and Overhead	280	1.40
Total Manufacturing Costs	$430	$2.15
Commercial Expenses:		
Fixed	30	.15
Direct	20	.10
Total Costs Delivered	480	2.40
Profit from above	$120	$ .60
Unabsorbed Fixed Overhead while Idle	30	.15
Net Profit	$90	$ .45

The foregoing statement shows that of the $.35 saved in the labor operations per article, an average of $.15 was lost through unabsorbed fixed overhead. In order to realize the entire saving in the labor costs, the production must be increased to a volume which will require the normal use of the facilities. Therefore, when the time required to manufacture an article is reduced 20 per cent, the volume of production must be increased 25 per cent in order to make full normal use of the facilities and to reflect the entire saving in the profits. As 200 operating hours per month were found to be normal and as the time of one hour required for each article was reduced to four-fifths of an hour, the total production for a normal month could be increased to 250 articles (200 divided by $\frac{4}{5}$), or an increase of 25 per cent of the former production of 200 articles per month. If the volume of production is accordingly increased, there will be no loss from unabsorbed fixed overhead and the results would be as follows:

(16)

	TOTAL FOR MONTH	COST PER HOUR
Fixed Overhead	$150	$ .75
Producing Overhead including Operator's Wages	200	1.00
Total (200 operating hours)	$350	$1.75

The statement of profits would be as follows:

(17)

	TOTAL FOR MONTH		AMOUNT PER ARTICLE
Sales (250 articles)		$750.00	$3.00
Cost of Sales:			
Material Used	$187.50	$ .75	
Labor and Overhead	350.00	1.40	
Total Manufacturing Costs	$537.50	$2.15	
Commercial Expenses:			
Fixed	30.00	.12	
Direct	25.00	.10	
Total Costs Delivered		592.50	2.37
Net Profit		$157.50	$ .63

Statement 2 showed the former net profit per article, when the normal volume of production was 200 articles per month, to be $.25 each. By increasing the volume of production to 250 articles per month, a saving of $.35 per article was made in the labor and overhead costs; and $.03 in the commercial expenses. The total saving of $.38 per article added to the former normal net profit of $.25 (statement 2) makes the new normal net profit of $.63, as is shown in statement 17.

Fixed Overhead Budget

In view of the fact that the absorption of the fixed overhead is of such vital importance in the financial operating results of a factory, it is often advisable to prepare a budget of the fixed overhead expenses and make a daily comparison of the amount absorbed with the actual expenses. If the sales are normal, the

unabsorbed overhead will indicate that the operation of the factory is not being properly directed or that the employment department is not efficiently functioning. When the fault does not lie with the manufacturing employees, the unabsorbed overhead will indicate that the sales department is not making its

FIXED OVERHEAD BUDGET

For the Month of January

DAY	OPERATING HOURS		OVERHEAD ABSORBED		BUDGET TOTALS	UNDISTRIBUTED	OVERDISTRIBUTED
	Daily	Total	Daily	Total			
1	10	10	$7.50	$7.50	$6.00	....	$1.50
2	10	20	7.50	15.00	12.00	....	3.00
3	10	30	7.50	22.50	18.00	....	4.50
4	10	40	7.50	30.00	24.00	....	6.00
5	10	50	7.50	37.50	30.00	....	7.50
6	4	54	3.00	40.50	33.00	....	7.50
8	8	62	6.00	46.50	39.00	....	7.50
9	8	70	6.00	52.50	45.00	....	7.50
10	8	78	6.00	58.50	51.00	....	7.50
11	8	86	6.00	64.50	57.00	....	7.50
12	10	96	7.50	72.00	63.00	....	9.00
13	4	100	3.00	75.00	66.00	....	9.00
15	8	108	6.00	81.00	72.00	....	9.00
16	7	115	5.25	86.25	78.00	....	8.25
17	7	122	5.25	91.50	84.00	....	7.50
18	4	126	3.00	94.50	90.00	....	4.50
19	4	130	3.00	97.50	96.00	....	1.50
20	4	134	3.00	100.50	99.00	....	1.50
22	4	138	3.00	103.50	105.00	$1.50	....
23	4	142	3.00	106.50	111.00	4.50	....
24	6	148	4.50	111.00	117.00	6.00	....
25	7	155	5.25	116.25	123.00	6.75	....
26	..	155	....	116.25	129.00	12.75	....
27	..	155	....	116.25	132.00	15.75	....
29	..	155	....	116.25	138.00	21.75	....
30	7	162	5.25	121.50	144.00	22.50	....
31	8	170	6.00	127.50	150.00	22.50	....

FIGURE 3.—Fixed Overhead Budget

quota. In a contract shop performing work according to the specifications of its customers, the labor cost of the orders taken is the only basis upon which a sales quota can be safely established.

The primary object in preparing the budget is to establish a goal to strive for and to see that the daily efforts are pro-

portionate to the monthly requirements, rather than to allow an entire month to pass before any correction or added effort is made.

The form of the budget will differ according to the requirements of each case. The budget in Figure 3 is given merely as a suggestion for the conditions cited in the foregoing illustrations.

The column headed "Budget Totals" on the foregoing budget represents the cumulative apportionment of the monthly fixed overhead upon the basis of a normal use of the factory facilities. It was found that the machine could be operated 200 hours per month under normal conditions and that the fixed overhead amounted to $150 per month, making a charge of $.75 per normal operating hour. The total normal operating time was based upon 4 hours per day for Saturdays and 8 hours per day for the remaining work days. Multiplying the normal operating hours by the normal cost of $.75 per hour, the fixed overhead was found to be $6 per day for the first five days of the week and $3 for Saturdays. Therefore, the fixed overhead as of the close of January 1 is entered in the column headed "Budget Totals" as $6 and the accumulative figure as of the close of January 2 is entered as $12, and so forth, in accordance with the daily normal operating hours.

The remaining figures on the budget are supposed to have been posted daily. Each day the time which the machine actually operated is posted to the budget, and the amount of the fixed overhead which was charged to the work performed by the machine is computed at the normal rate of $.75 per hour and entered in the columns for absorbed overhead. The difference between the absorbed total and the budget total is entered in the undistributed or overdistributed columns, as the case may be.

The budget shows that on January 16 the factory operations started to fall below normal, and by January 22 there was a

loss of $1.50 from undistributed overhead. The factory executives may see at a glance the financial effect of deviating from normal operations. It is almost certain that when a loss piling up from unabsorbed fixed overhead is brought to their attention daily, a more prompt and strenuous effort will be made to stop it.

Graphic Charts

The operating results from different volumes of business, based upon the original premise in the foregoing statements, are graphically depicted in Figure 4. It will be remembered that:

1. The fixed commercial expenses were $30 per month and the fixed overhead $150, making a total of $180 per month.
2. The product was sold and delivered as made.
3. Under normal conditions, 200 articles could be produced and sold per month.
4. The selling price was $3 per article, and when the production was normal the net profit was $.25 per article.

The scale at the left of the chart indicates the monetary value of the horizontal lines of the chart, and the scale at the bottom of the chart indicates the quantity of articles represented by the vertical lines.

The chart starts with unabsorbed fixed expenses totaling $180, no sales and a net loss of $180. Traversing the chart to the vertical line representing 200 articles, the normal volume of business for a month, it will be seen that:

1. All fixed expenses have been absorbed and the lines representing them converge at the zero line.
2. The sales amount to $600, and the charges against the sales total $550.

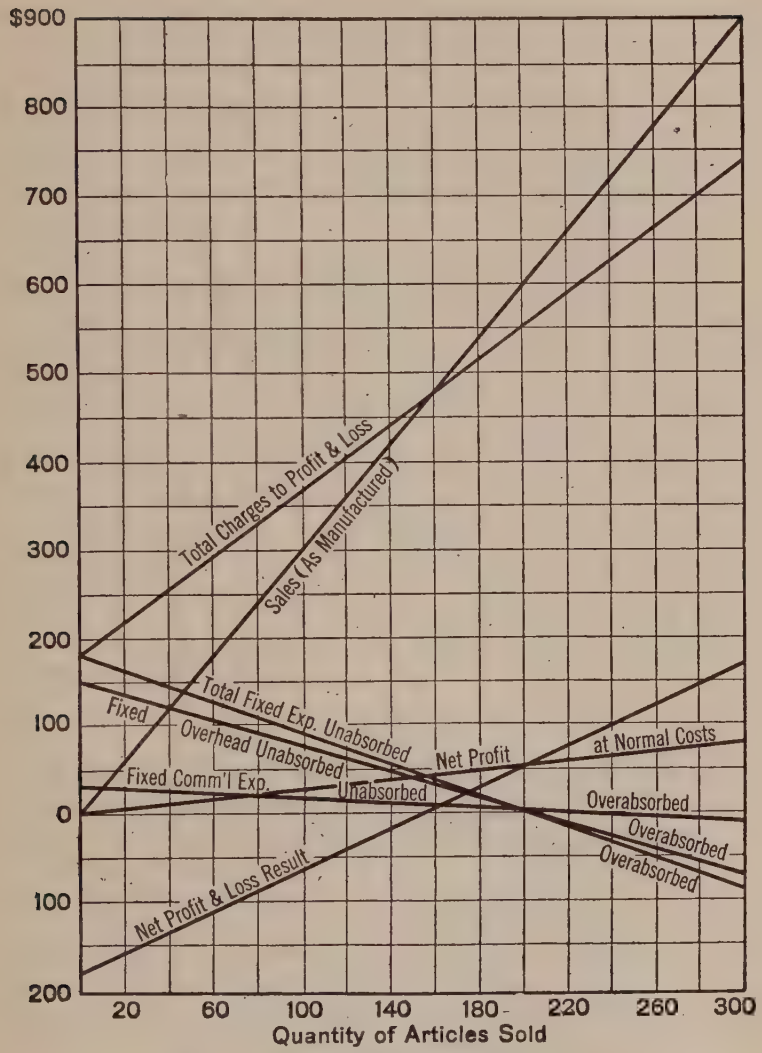


FIGURE 4.—Chart Showing Operating Results from Different Volumes of Business When Entire Production Is Sold

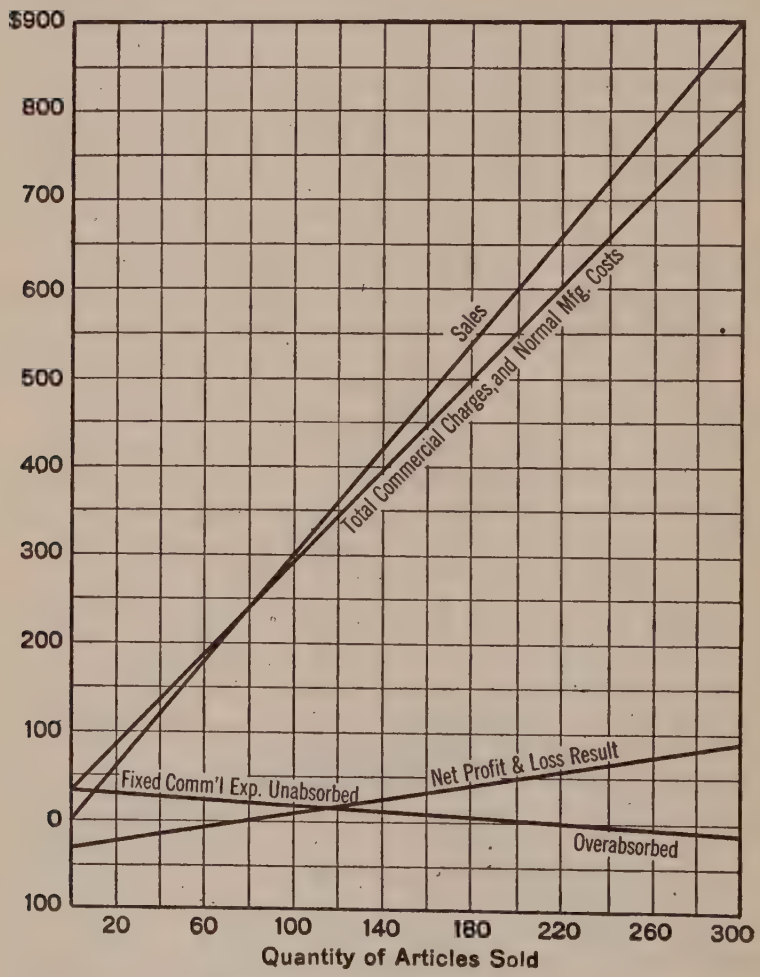


FIGURE 5.—Chart Showing Operating Results, Exclusive of Overhead Variance, from Different Volumes of Business

3. The net profit and loss result is a profit of $50 and the line converges with the line representing the profit at normal costs.

By reading the figures from the scale at the left of the chart, opposite the points where the drawn lines intersect the vertical lines, the results may be read for any volume of business up to 300 articles.

Figure 4 depicts a condition which is rarely found. Frequently the sales are not proportionate each month to the volume of production. The sales during a month may equal 50 per cent, while the production may be 100 per cent of the factory capacity. During the next month the sales may be increased to 100 per cent and the production reduced to 50 per cent of the factory capacity. Consequently, two charts are required to show the results from all the variations.

Figure 5 shows only the results from jobbing the product of the factory at normal costs. The normal volume of sales is 200 articles per month. The scale at the bottom of the chart indicates the quantity of articles represented by the vertical lines.

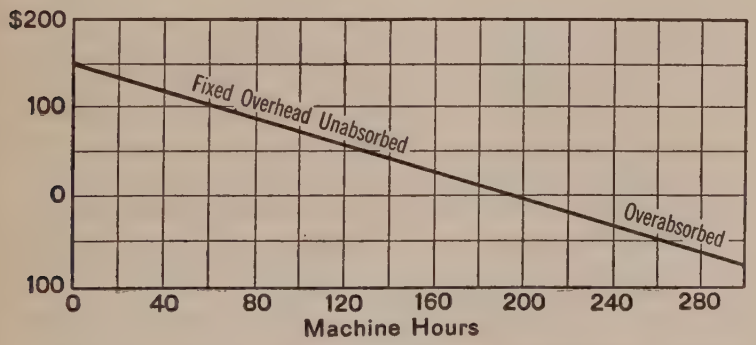


FIGURE 6.—Chart Showing Unabsorbed or Overabsorbed Overhead

Figure 6 shows the unabsorbed or overabsorbed overhead. The normal operating time is 200 hours per month. The scale

at the bottom of the chart indicates the number of machine hours represented by the vertical lines.

If 100 articles were sold and delivered, Figure 5 shows the net profit and loss result to be a profit of $10; and if the machine operated 200 hours, Figure 6 shows the fixed overhead to be entirely absorbed by the production. Therefore, the net profit of $10 shown in Figure 5 remains without adjustment.

If 200 articles were sold and delivered, Figure 5 shows the net profit and loss result to be a profit of $50; and if the machine operated only 100 hours, Figure 6 shows the unabsorbed fixed overhead to be $75. Combining the two results, the unabsorbed overhead of $75 must be applied against the jobbing profit of $50, making a net loss of $25.

CHAPTER XVI

DETERMINING THE VOLUME OF BUSINESS REQUIRED

Normal Profits Less Than Unabsorbed Fixed Expenses

By segregating the fixed overhead and fixed commercial expenses, and by allocating as an item of cost only the portion applicable to the business actually done, the loss due to a sub-normal volume of business may be ascertained by the amount of fixed expenses unabsorbed. If the normal operating profits or the excess of the sales over the normal costs are not greater than the unabsorbed fixed expenses, the net result is a loss and the question that naturally follows is how much business must be done to absorb the loss. It is surprising that the question is not more often asked, for the information is of vast importance in directing the affairs of a business. It marks the danger point and it gives the executives a basis for intelligently determining the amount of money that may be spent above the ordinary expenditures in order to increase the volume of business. Every effort should be exerted to bring the sales of each period at least to that point.

Such information may be easily ascertained from graphic charts constructed in the manner shown in the preceding chapter. It is not necessary to use the quantity produced and sold. In its place the total selling price may be used as a measure of the quantity. It is not even necessary that a cost system be in operation to construct the charts. It is necessary, however, to segregate the fixed expenses in the manufacturing and commercial groups of accounts from the producing and direct expenses.

Example—Profit and Loss Statement

To illustrate the procedure it is assumed that the following profit and loss statement has been presented for analysis:

PROFIT AND LOSS STATEMENT
For the Month of January

SALES		$100,000.00
COST OF SALES:		
Material Used:		
Inventory January 1	$23,000.00	
Purchases	25,000.00	
	$48,000.00	
Inventory January 31	25,000.00	
Material Used	$23,000.00	
Direct Labor	24,000.00	
Manufacturing Overhead	30,000.00	
Total Production Charges	77,000.00	
Deduct Increase in Processed Inventories	6,000.00	
Cost of Sales		71,000.00
GROSS PROFIT FROM SALES		$ 29,000.00
COMMERCIAL EXPENSES		35,000.00
LOSS FROM ABOVE OPERATIONS		$ 6,000.00
OTHER REVENUES (Net)		1,000.00
LOSS FROM ALL SOURCES		$ 5,000.00

After making sales of $100,000 and losing $6,000 from the operations, the executive desires to know how much business will have to be done to break even, if all costs are maintained in accordance with the results shown on the foregoing statement. To answer the question, it is first necessary to analyze the expenses to determine the amount of fixed charges. It is assumed that this was done and that the fixed expenses in the manufacturing overhead amounted to $18,000, and in the com-

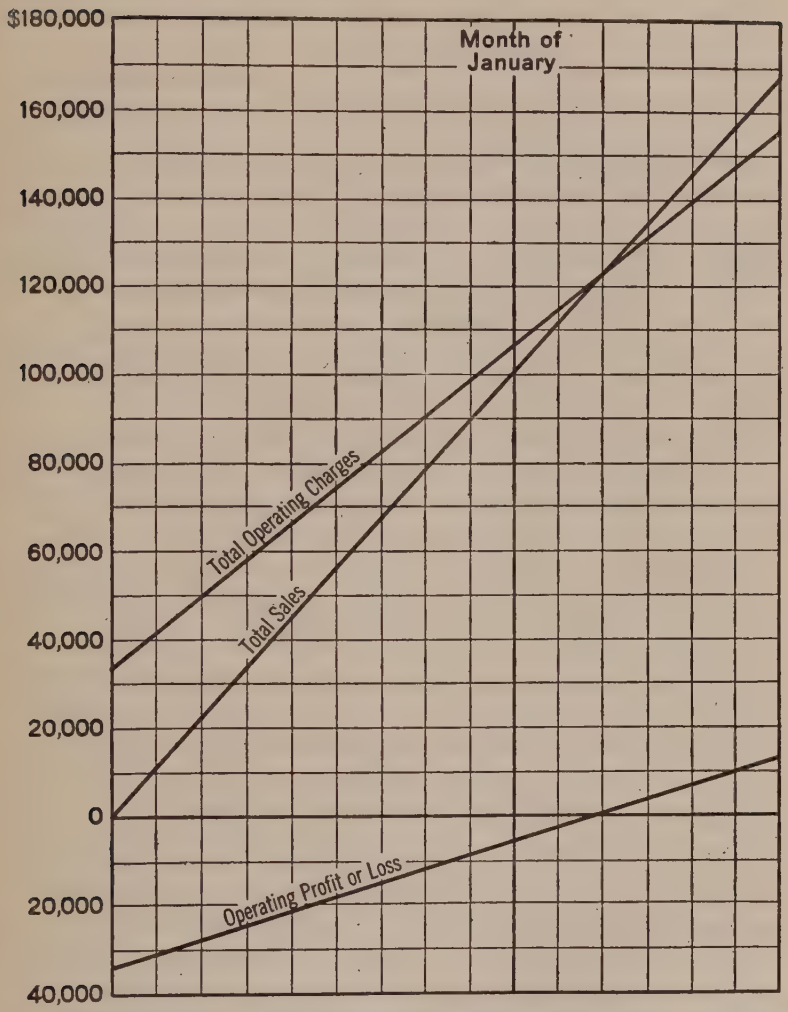


FIGURE 7.—Chart Showing Amount of Business Necessary to Overcome an Experienced Loss

mercial expenses to $16,000, or a total of $34,000. Supplementing the profit and loss statement with this information, the results are charted as shown in Figure 7.

Construction of Chart

In the preparation of the chart, the first thing done was to insert the required scale at the left. Next a vertical line was drawn in a convenient place on which the actual results of the period might be marked. A dot was placed on this line opposite the figure in the scale corresponding to the amount of the sales ($100,000), as shown on the profit and loss statement. A line was then drawn connecting the zero at the extreme left with the dot marking the sales for the month.

By referring to the foregoing profit and loss statement, it will be seen that the cost of sales for the month amounted to $71,000, and the commercial expenses to $35,000, making a total operating charge of $106,000. Therefore, a dot was placed upon the vertical line on which the results for the month are to be marked, at the intersection of the horizontal line representing $106,000 according to the scale at the left of the chart. The fixed expenses were found to be a total of $34,000, and as this represents the first item of cost regardless of production volumes, a dot was placed at the extreme left of the chart on the horizontal line representing a corresponding amount. A line was then drawn to connect this dot to the dot marking the operating charges for the month.

If the organization is maintained and no business is done the total of the fixed expenses will be the amount of the loss. All other expenses could be stopped. Consequently, the first loss in this case is $34,000, and it was marked by a dot below the zero line at the extreme left of the chart. The actual loss of $6,000 for the month was then marked by a dot placed on the vertical line registering the monthly results, at the intersection of the horizontal line representing a corresponding

amount below the zero line. A line was then drawn between these two dots.

Reading the Chart

The chart shows the operating results, corresponding with the actual situation set forth on the profit and loss statement submitted, for all volumes of business within the limitations of the chart. The operating charges and the profit or loss for any amount of sales may be found by reading the scale opposite the intersection of the legend lines with each of the vertical lines. Thus, it will be seen that with sales of $78,000, the operating charges will be $90,000 and the loss will be $12,000. It will also be seen that the lines representing the sales and the operating charges converge at approximately $121,000 and that the profit or loss line intersects the same vertical line at zero. Consequently, based upon the same selling prices, producing and direct costs, and all other operating conditions reflected in the results shown upon the profit and loss statement submitted, sales of approximately $121,000 are required before a profit can be made in the instant case.

If it is desired to know the volume of business required to make a profit of $5,000 with the same relative conditions, it may be found by reading the scale opposite the point where the sales line intersects the same vertical line crossed by the profit or loss line at the horizontal line representing $5,000. Thus it will be seen that sales of approximately $139,000 are required before a profit of $5,000 can be made.

The results shown on the chart may be proved and computed exactly by a simple calculation. It will be remembered that the total operating charges amounted to $106,000. After deducting the fixed expenses of $34,000 from the operating charges of $106,000, the balance of $72,000 allows a profit of $28,000 from the sales of $100,000, or a 28 per cent profit to provide for the fixed expenses. As the fixed expenses were

$34,000 and it was found that they must be 28 per cent of the sales, to break even, the sales must be $121,428.57. It may also be computed as follows: The fixed expenses of $34,000 were entirely absorbed by the business except to the amount of $6,000 as shown by the loss for the month. Consequently, sales of $100,000 provided for $28,000 of the fixed expenses, and to determine the sales required to absorb the actual fixed expenses of $34,000, it may be computed as follows:

$$28{,}000 : 100{,}000 :: 34{,}000 : x$$
$$28x = 3{,}400{,}000$$
$$x = 121{,}428.57, \text{ or the amount of sales required}$$

To further prove the foregoing computations and to show the effect upon all of the operating figures, the following profit and loss statement is submitted. Each of the figures with the exception of those representing the fixed expenses has been increased 21.42857 per cent of the amounts given on the original statement submitted for the month to correspond with the increase in sales, and the results are shown in the columns headed "Monthly Requirement."

PROFIT AND LOSS STATEMENT

	MONTH OF JANUARY		MONTHLY REQUIREMENT	
SALES		$100,000.00		$121,428.57
COST OF SALES:				
Material Used	$23,000.00		$27,928.57	
Direct Labor	24,000.00		29,142.86	
Manufacturing Overhead:				
Fixed	18,000.00		18,000.00	
Producing (50% of labor)	12,000.00		14,571.43	
Total Production Charges	$77,000.00		$89,642.86	
Deduct Increase in Processed Inventories	6,000.00		7,285.71	
Cost of Sales		71,000.00		82,357.15
GROSS PROFIT FROM SALES		$29,000.00		$39,071.42

COMMERCIAL EXPENSES:				
Fixed	$16,000.00		$16,000.00	
Direct (19% of sales)	19,000.00		23,071.42	
Total		35,000.00		39,071.42
LOSS FROM ABOVE OPERATIONS		$ 6,000.00		None

Changes in Selling Price and Variable Cost Items

The executives may also desire to know what the effect will be if certain contemplated changes in the selling price and variable items of cost are made. The answer may be very easily charted. If it is assumed that upon investigation they find that a saving of $7,000 would have been made, if the anticipated changes had been effective during the month covered by the statement, a chart (Figure 8) may be prepared similar to the first one and a new line drawn to connect the dot marking the total fixed expenses with a dot at $99,000 on the vertical line showing the actual results for the month, thereby giving effect in the current month to the proposed reduction of $7,000 in the operating charges. In anticipating the results in the future during which the saving will actually become effective, the old line will be ignored except for comparative purposes.

Likewise, if it is proposed to increase the selling prices 5 per cent, the effect may also be shown by a new line on the chart. If the increase had been effective during the month covered by the statement the sales would have been $105,000 instead of $100,000. A new line may be drawn on the chart (Figure 8) connecting the zero at the left with a dot marking the intersection of the horizontal line representing $105,000 with the vertical line on which the results of the month were marked.

Eliminating Increase in Inventories

By reviewing the profit and loss statements submitted in

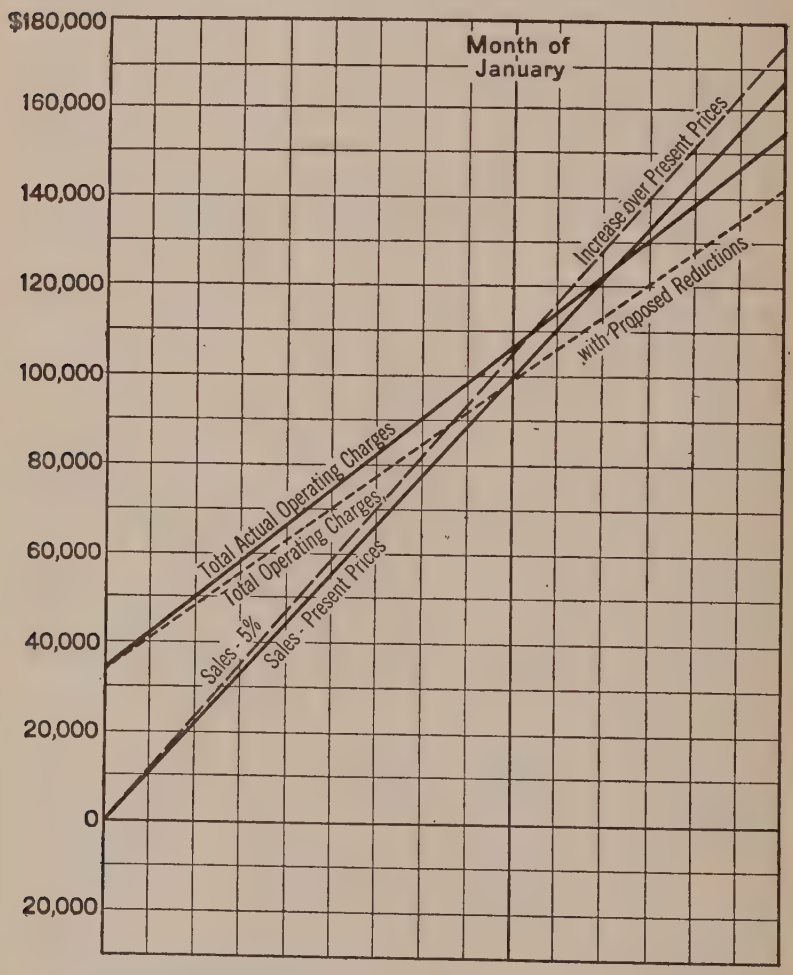


FIGURE 8.—Chart Showing Effect of Changes in Selling Price and Variable Items of Cost

the foregoing discussion, it will be observed that the production charges exceeded the cost of sales, and accordingly the inventories of work in process, manufactured parts, and product increased. Naturally, that cannot go on forever, and if it is desired to know what volume of business must be done to break even and at the same time manufacture no more than the sales' requirements, the amount of fixed charges absorbed by the product added to the inventories must be taken into the calculation. If the amount cannot be definitely ascertained, it can be approximately determined. It will be remembered that the fixed overhead was $18,000, the total production charges were $77,000, and the increase in the processed inventories was $6,000. Therefore:

$$18{,}000 : 77{,}000 :: x : 6000$$
$$77x = 108{,}000$$
$$x = 1{,}402.59, \text{ or the approximate amount of fixed overhead}$$

In computing the monthly requirements for the profit and loss statements given, the increase in processed inventories was allowed to absorb its share of the fixed overhead, but now that it is desired to eliminate the increase through a corresponding decrease in production, it is evident that if the decrease had been effective and the production only equal to the sales' requirements, the cost of sales would have had to bear the amount of fixed overhead absorbed by the production transferred to the processed inventories. Consequently, the loss would have been $7,402.59, or $1,402.59 greater than the loss actually sustained, and the total operating charges would have been $107,402.59 instead of $106,000. The chart in Figure 9 illustrates the effect of the foregoing changes.

It will be seen from the chart that to cope with the conditions cited sales of approximately $128,000 are required to break even. The exact amount may be found by the same methods used in the previous case. Under the new conditions,

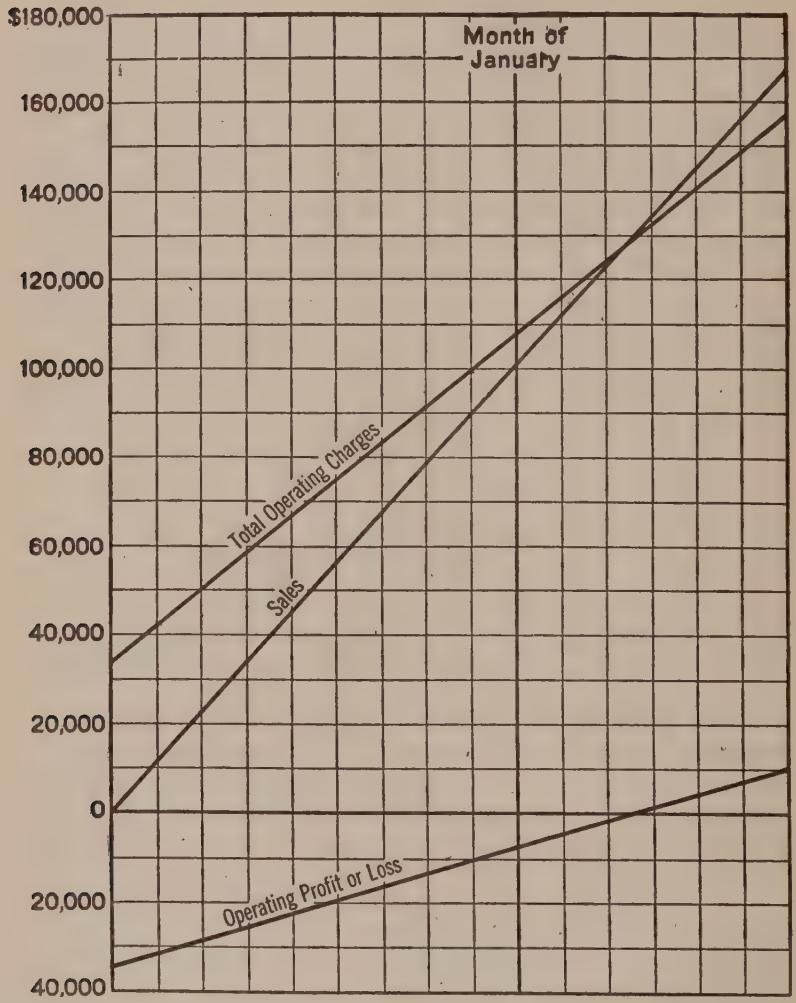


FIGURE 9.—Chart Showing Amount of Business Necessary to Overcome an Experienced Loss When Production Is Equal to Sales Requirements

sales of $100,000 have absorbed $26,597.41 of the fixed expenses (the total fixed expenses of $34,000 less the loss of $7,402.59). Therefore,

$$26{,}597.41 : 100{,}000 :: 34{,}000 : x$$
$$26{,}597.41x = 3{,}400{,}000{,}000$$
$$x = 127{,}832.00, \text{ or the amount of sales required}$$

To prove the above amount shown as the sales required, with a complete profit and loss statement, it is necessary without further data to make a distribution of the cost of sales figure to determine the cost of the individual items included therein in the same proportion that each is to the total production charges. Thus, the following results are found:

	CHARGES TO PRODUCTION	INCREASE IN PROCESSED INVENTORIES	COST OF SALES
Material Used	$23,000.00	$1,792.21	$21,207.79
Labor	24,000.00	1,870.13	22,129.87
Manufacturing Overhead:			
Direct	18,000.00	1,402.59	16,597.41
Producing	12,000.00	935.07	11,064.93
Totals	$77,000.00	$6,000.00	$71,000.00

From the foregoing statement it will be seen that the material used in the product sold cost $21,207.79 and the labor $22,129.87. As the total sales amounted to $100,000, it is evident that the material and labor costs were respectively 21.20779 per cent and 22.12987 per cent of the sales. Therefore, 21.20779 per cent of $127,832 was computed as the cost of material used on the sales required to break even; and 22.12987 per cent of $127,832 was computed as the cost of the labor used in the sales. The source of the remaining figures shown in the columns headed "Monthly Requirement" on the following profit and loss statement is self-evident.

PROFIT AND LOSS STATEMENT

		MONTH OF JANUARY		MONTHLY REQUIREMENT
SALES		$100,000.00		$127,832.00
COST OF SALES:				
Material Used	$23,000.00		$27,110.34	
Direct Labor	24,000.00		28,289.05	
Manufacturing Overhead:				
Fixed	18,000.00		18,000.00	
Producing (50% of labor)	12,000.00		14,144.53	
Total Production Charges	$77,000.00		$87,543.92	
Deduct Increase in Processed Inventories	6,000.00			
Cost of Sales		71,000.00		87,543.92
GROSS PROFIT FROM SALES		$29,000.00		$40,288.08
COMMERCIAL EXPENSES:				
Fixed	$16,000.00		$16,000.00	
Direct	19,000.00		24,288.08	
Total		35,000.00		40,288.08
LOSS FROM ABOVE OPERATIONS		$ 6,000.00		None

Production and Sales Varying in Different Ratios

When the production does not vary in direct ratio with the sales, it is advisable to separate the manufacturing activities from the marketing activities and to prepare a chart for each, as illustrated in the preceding chapter. By combining the results found on each chart, the final results may be determined.

The results based upon the operating charges of one period may be forecasted for various volumes of business in subsequent periods. They will actually be realized if the same relative conditions prevail. As changes are made the charts will have to be revised. Even "fixed" expenses are subject to change and are not fixed for an indefinite period. But a complete knowledge of the existing conditions and their possibilities is essential to grasp intelligently the effect of and to cope with the changes forced upon us.

PART III

ILLUSTRATIONS OF COST SYSTEMS

CHAPTER XVII

VARIATIONS IN COST METHODS

Suiting Cost System to Existing Conditions

The relative ease with which costs are accumulated depends entirely upon the manner in which the factory is operated. The records must follow the same routine as the production, and if the production is thoughtfully and systematically planned, the records will follow naturally in the same order, and—of more importance—the production costs will be at a minimum. However, the conditions as found in a factory must be partially accepted. If a factory is making its first step toward efficiency and decides to install a cost system, it is better to avoid complications, which would discourage further efforts, and start with a system in its simplest form, rather than attempt a complete reorganization. Of course a simple system may not have an artistic finish in setting forth points of detail, but at least it is practical in its service, encouraging future steps toward better administration. In such cases it is surprising to note how quickly the executives themselves will increase their demands for more cost data, and it is, therefore, necessary to devise the system in a manner which will permit expanding.

The individuals employed in the factory must also be considered when installing a cost system for the successful functioning of the system depends upon their co-operation. The cost records are based entirely upon reports issuing from the factory employees, and it is therefore very important to see that they understand the correct purpose of the system and appreciate the benefit it will be to them. They cannot expect

to receive an increase in wages unless the factory as a whole makes a profit, and if a cost system will aid in increasing its profit, they also will benefit. It is also certain that if the executives have full knowledge of the effect of all operations, they will be less susceptible to mistakes, the business will be upon a more solid foundation, and the position of the operators will be more secure.

Furthermore, the system will help to place the employees in the positions for which they are best fitted. If a good worker is slow in performing certain operations it is because he is not adapted to the work, and when he is employed on those particular operations all of the benefits that might be gained from work wherein he excels are lost, and the average standard for other employees will be lowered by a repetition of such assignments. An individual enjoys doing the things in which he excels and therein he is more profitable to himself and to his employer. If the employer appreciates these facts, his co-operation can be relied upon.

Preliminary Survey of Plant Operations

Previous to the determination of the methods to be used in a cost system, a thorough study should be made of the production operations and the salient items in the cost of the product. Too much importance cannot be given to the preliminary survey, and if properly made, the conditions found will suggest the methods to be used for the accumulation of the costs. Short cuts devised for one system may sometimes be successfully adapted to another, but the theory underlying the short cuts must primarily be originated from the methods employed in the physical operations of the plant.

Cost Methods Varying With Production Methods

Uniform cost principles may be properly used to determine the classification of various items of cost for all factories in

the same industry. Uniform methods of adapting these principles are often impractical. The forms, the methods, and the manner of recording and accumulating cost data should be devised for each particular factory so as to fulfil the requirements in the most economical and practical manner. The conditions in some factories may be similar and may permit the adoption of uniform methods, but that should be decided only after a study covering every operation performed, the method of determining production requirements and of issuing orders to the factory employees for production, the quantity usually made on each order, the number of operations and the variation in the operations performed on different parts or articles, and the facilities in the factory for determining the exact amount and kind of material actually used for each kind of article made.

The methods to be adopted are left entirely to the skill of the systematizer, and cannot be standardized even for factories in the same industry unless their production methods are alike. In every case, however, the results can be segregated in such a manner as to be comparable with those of other factories of the same nature, but it should not be assumed that a system devised for one factory can be installed in another factory without modification. Invariably the production methods will differ, and consequently it will be found that changes can be made to advantage in the manner of handling the detail of the cost system for each factory.

The ready-made system is never satisfactory. No thought should be given to what has been done in other cases. If any of the methods used in one case are also used in another, that is merely a coincidence and in no way indicates a standardization of the methods.

When devising a cost system, the factory operations should first be thoroughly analyzed and the entire system and the method of handling every detail should be clearly defined before its installation is begun. Everything should be started simul-

taneously. When a cost system is devised and put into operation on the instalment plan, the records are never properly co-ordinated, for each step is made without knowledge of its effect on the ensemble.

Hypothetical Cases Taken

The three following chapters are devoted to the treatment of costs for hypothetical cases. The three most common methods of cost finding have been used: namely, the order or job method, the process method, and the operating unit method.

The cost system of one factory may employ all of the methods of cost finding, but in the following descriptions such complications have been avoided. Each method has been treated separately in order to bring out clearly the requirements of each without confusion.

First the factory is described; next the operation of the system is given; then the journal entries required to enter the factory operations on the general books are shown; and last the inventory accounts are outlined.

These descriptions are not given as ready-made systems. All of the various elements of costs have been previously discussed, and the following descriptions are given merely to correlate them under each of the three most common methods of cost finding. They will also illustrate the practical application of the theory of costs.

If the requirements and the cost system for the simple conditions given in the cases in the ensuing chapters are understood, no difficulty will be experienced in devising methods to provide for an extension of the system to handle more complex situations. Fortified with a clear conception of the principles of cost accounting, the systematizer will not be bound by precedents within his experience, but will evolve his methods of accumulating cost data in the most economical manner from an analysis of the physical factory operations.

CHAPTER XVIII

ORDER OR JOB COST SYSTEM ILLUSTRATED

Statement of Conditions

Article Manufactured

The factory under discussion manufactures an article in five different models. Each model is assembled from parts which, with the exception of a few special parts that are purchased from others, are made in the factory. For economy in production various minor assemblies are made from certain parts and stocked until required. The minor assemblies are then combined with other parts to produce the completed article.

No repair work is done for customers, but single parts and minor assemblies are sold for replacements to be made by the customers. If within the guaranty provisions, replacements are made gratis; otherwise a charge is made for the items shipped.

Departments

The factory was found to have four distinct departments, which were designated A, B, C and D. The machining operations for the manufacture of parts are performed in Departments A, B and C. All assemblies are made in Department D. The factory departments coincide with the cost accounting requirements. Each of the machine departments contains a class of machinery which is different from that of the other departments in its nature and in its operating costs. The machines within any one of the departments are of a like nature and can be operated at the same hourly cost.

Stockrooms

A stockroom, designated as stockroom No. 1, has been provided for the deposit of raw materials until they are withdrawn for production purposes in the machine departments. Another stockroom, designated as stockroom No. 2, has been provided for the deposit of all parts, whether purchased from others or made in the factory, until they are withdrawn for use in the assembly department or to be shipped to customers for replacements. When minor assemblies are completed in Department D, they also are deposited in stockroom No. 2 until required for the final assembly of the completed article. A third stockroom, designated as stockroom No. 3, has been provided for the deposit of finished or completed product until shipped to customers.

Briefly the stockrooms are as follows:

No. 1—Raw materials
No. 2—Finished parts (including minor assemblies)
No. 3—Finished product

System Instructions

The Inventory to Start

The operation of the cost system is to be started on the first day of the month. Just prior thereto the materials should be arranged to facilitate the work of taking a complete inventory of the merchandise. All materials in the production departments, raw, parts, or assemblies, which are not held for the completion of unfilled production orders should be returned to the proper stockroom. It is desired to have all material correctly located before it is listed on the inventory records.

The inventory should be taken as of the first day of the month and summarized according to the following classification:

1. Raw materials in stockroom No. 1
2. Finished parts and minor assemblies in stockroom No. 2

3. Finished product in stockroom No. 3
4. Work in process

The general instructions for taking the inventory of each of the above classes of material are as follows:

1. Only the raw materials actually in stockroom No. 1 should be classified as the "raw material inventory." They should be fully described on the inventory records and priced at invoice costs plus freight if it is of consequential amount.

2. Only the finished parts and minor assemblies actually in stockroom No. 2 should be classified as the "finished part and minor assembly inventory." When listing them on the inventory records, the part number and a full description should be given for each item. The parts purchased from others should be priced at invoice cost plus freight if it is of consequential amount. The parts and minor assemblies made in the factory should be priced at the estimated cost of the material and labor used to make them plus the allotted overhead figured upon the labor hours at the normal departmental rates.

3. Only the finished product actually in stockroom No. 3 should be classified as the "finished product inventory." The part number and a full description should be given for each item listed on the inventory records. The completed articles should be priced at the estimated cost of all parts and minor assemblies used, the labor required for assembling, and the allotted overhead figured upon the labor hours at the normal departmental rates.

4. All materials in the production departments should be listed as work in process. They should be fully described on the inventory records and the order number should be shown on which the material is being used or is to be used. The raw materials held for use on uncompleted production orders should be priced at cost. The raw materials on which operations have been performed should be priced at the cost of the material used and of the labor for the operations performed, plus the

allotted overhead figured on the labor hours at the normal departmental rates. The parts withdrawn for assembly orders should be priced at cost, as described above in (2). The assemblies in process of manufacture should be priced at the estimated cost of parts contained therein and of the labor for the assembly operations performed, plus the allotted overhead figured on the labor hours at the normal departmental rates.

The books should be closed and the merchandise accounts adjusted to the new inventory figures.

General Outline of System

Primary Records. Upon the completion of the inventory, a stock record card is to be opened for each kind of raw material, finished part, assembly and finished product in the stockrooms, and the quantity and unit cost of each is to be posted thereto from the inventory records. The cards for each stockroom are to be grouped and filed separately. The raw material cards are to be filed in alphabetical order and all other cards are to be filed according to part or symbol number. Upon the receipt of materials purchased from other concerns, a receiving slip will be made and delivered to the cost department. The quantity of the materials received will be added to the balance shown on the stock record to be on hand, and the unit cost will also be posted. As the materials are used they will be reported on requisitions which will be credited to the stock record cards, cost priced and charged against the orders on which the materials are to be used. The delivery of parts, assemblies, and the finished product to the stockrooms from the factory will be reported on transfer slips, from which the quantity and unit cost will be posted to the stock record cards. The transfer slips will be credited to the cost sheets and priced in accordance with the charges thereon. A copy of the shipping orders will serve as a requisition on the stockrooms for the product and parts to be shipped to customers.

PRODUCTION AND SHOP ORDERS. The costs are to be determined for each order issued and it is therefore desirable not to combine the production of more than one kind of article on an order. Separate production orders should be issued for each kind of part, minor assembly and final assembly of the product to be made, and the quantity ordered on each should be limited to one month's requirements. Thus, when an order is issued for the manufacture of a quantity of a certain part, the total charges to that order will represent the cost of making that quantity of that part. Likewise, by issuing separate orders for each kind of assembly, the assembly costs are also acquired in the same simple manner. The production orders are to be numbered serially as issued from No. 5001 up.

When special repairs, new tools, fixtures, and so forth, are to be made, the instructions are to be given on a shop order. The shop orders are to be numbered consecutively from 1000 to 5000 as issued. They are to be treated in the same manner by the factory employees as the production orders.

STANDING ORDERS. The remaining activities of the factory which cannot be directly accounted for against the production and shop orders are to be authorized by blanket standing orders as follows:

Order No. 100—Charge all time of keeping stores and receiving materials in stock to this order number.
Order No. 101—Charge all time of trucking materials to this order number.
Order No. 102—Charge all time of inspecting materials and work performed in the factory to this order number.
Order No. 103—Charge all time of sweeping and cleaning to this order number.
Order No. 104—Charge all time of making minor repairs to the building to this order number.
Order No. 105—Charge all time of making minor repairs to the machinery to this order number.

Order No. 106—Charge all time of salvaging and reworking materials spoiled by employees in the factory to this order number.

Order No. 107—Charge all time of crating and shipping materials to customers to this order number.

Order No. 108—Charge all miscellaneous indirect labor which cannot be classified under the foregoing orders to this number.

An order is to be provided for everything to be done by the factory. No work is to be done without an order.

System in Operation. When a quantity of a certain part is desired by the superintendent, he will issue a production order for its manufacture and send a copy to the foreman of each department in which the work is to be performed. The foreman of the department in which the first operation is to be performed will make a requisition on the raw material stock-keeper, showing the material required and the order number on which it is to be used, and withdraw the material from the stockroom to his department. He will then assign the work to his employees, and they will charge the time which they consume on it to the number of the order authorizing the work. If some operations are to be done in another department, the work will be forwarded and the employees there will also charge the time for their work to this order number. When the order is completed the foreman in whose department the last operation was performed will deliver the finished parts to stockroom No. 2 and get a receipt from the stock-keeper on a transfer slip.

In the office a cost sheet will be opened for each production order issued, and when the requisition for the material withdrawn from stock is received from the stock-keeper, it will first be priced and then credited to the stock record and charged to the cost sheet. The cost of the labor of the men performing the work will be charged from the employees' time tickets to the cost sheet for the order. Overhead will then be added on

the basis of the labor hours. When the transfer slip is forwarded to the cost department, it is their notification of the completion of the order. The cost sheet is then added and the total cost is entered on the transfer slip; the stock card for the finished part is charged with the quantity and the unit price is noted thereon.

When a production order is issued for an assembly of parts, the assembly foreman will draw a requisition on the finished parts stockroom for the parts required, indicating the order number for which the parts are to be used. The assemblers will charge the time consumed on the work to the order number. When the order is completed, the foreman will deliver the assemblies to the stock-keeper and report the quantity on a transfer slip. As the requisitions and time tickets are delivered to the cost department, they are extended and charged to the cost sheet for the order number designated thereon. When the transfer slip is received, the overhead is added to the cost sheet, and the total cost is inserted on the transfer slip. The cost sheet is then withdrawn from the open order file, and the transfer slip is charged to the stock record for the stockroom to which the assembly has been delivered.

When orders are received in the office from customers, a shipping order is made out and three copies are sent to the shipping clerk. He will use one copy as a requisition to the stock-keeper for the product to be shipped. One copy will be used as a packing slip and the remaining copy will be delivered to the accounting department as notification of shipment and for billing.

When repair parts are ordered by customers, another form of shipping order, called "repair order," is to be issued and used in the same manner as the shipping order. The distinction between the two orders is mainly for accounting purposes, as will be seen in the following description.

Description of Forms

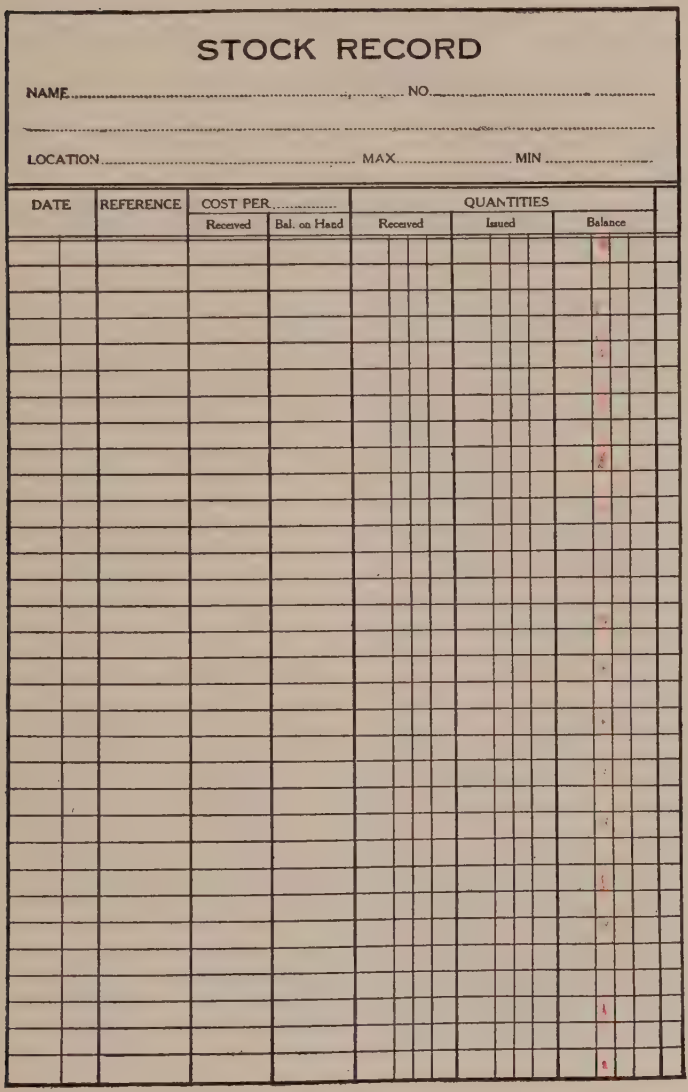
Orders

A list and description of all standing orders should be given to each foreman. Shop orders should be numbered from No. 1000 up to 5000 as issued, and production orders should be numbered from 5001 up as issued. Enough carbon copies of the orders should be made so that each department concerned may have one. One copy should remain in the superintendent's office; one copy should be delivered to the cost department; and one copy should be given to each of the foremen in whose department the work is to be performed. When the foremen complete the work in their department, they will turn in their copy of the order to the cost department. The face of the orders provides for the instructions to be written thereon and the back of the order is arranged for production notations of the foreman.

Stock Record Cards

A separate stock record card (Figure 10) is to be used to perpetuate the inventory record of each kind of raw material, finished part, minor assembly, and finished product. The quantity of each on hand when the inventory was taken and the unit cost should be posted to the respective cards. There will be three groups of cards—one for raw material; one for finished parts and minor assemblies; and one for finished product.

When raw materials are received, they will be reported on receiving slips, from which the quantity and unit cost should be entered on the stock record cards. If raw materials are to be returned to the shipper, the shipping department will be instructed upon a return purchase slip, which will be made in duplicate. One copy will be used as a requisition on the stockkeeper and thereupon forwarded to the cost department for credit to the stock record cards. All raw material withdrawn


STOCK RECORD

NAME..... NO.....

LOCATION..... MAX..... MIN .....

DATE	REFERENCE	COST PER.....		QUANTITIES		
		Received	Bal. on Hand	Received	Issued	Balance

Figure 10.—Stock Record Card

from the stockroom for use in production will be reported on requisitions from which the stock record cards will be credited. If upon the completion of an order there is any unused material, it should be returned to the stockroom and reported on a transfer slip from which the stock records will be charged. The return purchase slips, requisitions, and transfer slips are to be cost-priced at the time the postings are made to the stock record cards.

When parts which have been purchased from other concerns are received, they will be reported on a receiving slip and added to the quantity shown to be on hand on the stock record cards. At the same time the unit cost and receiving slip number is also posted to the stock record cards. When parts which have been made in the factory are delivered to the finished parts stockroom, they will be reported on a transfer slip, and the unit cost and quantity will be posted to the stock record cards. When parts or assemblies are withdrawn from the finished parts stockroom, they must either be used for production or shipped to customers. If they are to be used for production, they will be reported on a requisition, and if they are to be shipped to customers, they will be reported on a repair order, and credit will be given to the stock record cards from each.

When the finished articles are delivered to the finished product stockroom, they will be reported on a transfer slip and added to the quantity on hand on the stock records. The unit cost and the order number on which they were made will also be entered on the stock records. When the finished articles are to be shipped to customers, they will be withdrawn from the finished product stockroom on a shipping order, which will be cost-priced as it is entered on the stock records.

Receiving Slips

A separate receiving slip (Figure 11), made in duplicate, is to be used to report all material received on each purchase

RECEIVING SLIP

No. 321

DATE ..... 19 ..... PACKING SLIP NO. ..... PUR. ORDER NO. .....

Received from	Transportation Line	Frt. Pro. No.	Frt. Charges
No. Packages ..... Form	Delivered By		Cart'ge Ch'ges

Quantity	Weight	Description	Unit	Unit Cost	✓	Condition

Checked By ..... Delivered To ..... Posted By .....

FIGURE 11.—Receiving Slip

RETURN PURCHASE SLIP

No. 144

RETURNED TO ..... DATE ..... 19 .....

ADDRESS ..... PUR. ORDER NO. .....

Quantity	Unit	Description	Cost				✓
			Unit		Total		

How Packed ..... Shipped Via ..... Sent By .....

FIGURE 12.—Return Purchase Slip

order number. Both copies are to be delivered to the office, where the duplicate will remain to be attached to the invoice. The unit prices are to be entered on the original, which will then be delivered to the cost department where the quantities, unit costs, and the receiving slip number will be posted to the stock record cards. The originals will then be filed, according to number, in the cost department.

The charges to the stock accounts for purchases are to be made from the purchase record. No entry is to be made in the general books from the receiving slips.

Return Purchase Slips

All materials returned to a shipper are to be recorded on a return purchase slip (Figure 12), which is to be made in quadruplicate and numbered serially. The quadruplicate copy is to remain in the office, and the remaining three copies are to be delivered to the shipping clerk. The triplicate copy will be used as a packing slip; the duplicate as the shipping clerk's report to the office of the details in regard to the shipment, from which the invoice will be made; and the original will be used as a requisition and credited to the stock records.

The credit to the stock accounts for materials returned to shippers is to be made from the office invoices. No entry is to be made on the general books from the return purchase slips.

Requisitions

The stock-keepers have been instructed to allow no material to leave the stockrooms without receiving a requisition. All material withdrawn for use in the factory will be reported on a requisition (Figure 13) showing the order number on which it is to be used. The requisitions are to be made in duplicate and signed by the foreman withdrawing the materials. Both copies are to be given to the stock-keeper, who will keep one as a receipt for the material which he has issued, and send the

other copy to the cost department, where the stock records will be kept. In the cost department the requisitions will be credited to the stock cards, charged to the cost sheets, and then filed according to order number for each stockroom.

At the close of each month the total of the requisitions from each stockroom will be credited to the respective stock accounts in the general books, and charged to the Work in Process account.

REQUISITION ORDER NO.....

DATE..... 19 ..... STOCK ROOM.....

To Stockkeeper: Please supply the following materials: DEPT. .....

Quantity	Unit	Description	Cost			
			Unit		Total	

Posted By..... Signed .....
Foreman

FIGURE 13.—Requisition Form

Time Tickets

A daily time report (Figure 14), approved by the departmental foreman, is to be made by each employee, showing the disposition of his time for the entire day. The employee will show the time he worked on each order number, and in the office the total time so reported will be checked with the clock cards. The employees' wages will then be extended for the time consumed on each order and posted to the cost sheets. The tickets will then be filed according to employee number for future reference.

The cost department will make a daily summary of the wages computed on the individual time tickets for each department and prove it with the payrolls. Separate payrolls will be made for the wages due to all factory employees, except foremen who will not be required to report a distribution of their time. The direct labor for each department will be found by deducting the total charges to standing orders from the total payroll for the respective departments. For convenience, the total payroll

TIME TICKET

EMP. NAME..... EMP. NO.....

O.K.'d BY..... DEPT..... DATE..... 19.....

Order No.	Operation	Quantity Completed	Hours	Wages		√
Rate per Hour.....		Totals				

FIGURE 14.—Daily Time Ticket

will be charged to Work in Process and credited to the Accrued payroll account. After crediting the Work in Process account with the charges to the standing orders, the net balance between the two entries will equal the direct labor only.

Cost Sheets

A separate cost sheet (Figure 15) should be opened for each standing order, shop order, and production order issued by the superintendent. After the requisitions have been priced

COST SHEET

DESCRIPTION OF WORK .....

DATES:
STARTED .....
FINISHED .....

ORDER NO. .....
QUANTITY ORDERED .....
QUANTITY COMPLETED .....

LABOR COSTS																							
Date	Emp. No.	Quan. Comp.	Hours	Wages		Overhead		Date	Emp. No.	Quan. Comp.	Hours	Wages		Overhead		Date	Emp. No.	Quan. Comp.	Hours	Wages		Overhead	

from the stock records, they will be charged to the cost sheets. Columns are to be headed on the cost sheets for each of the operations required in the execution of the orders, designating also the department in which the work is performed, and after the time tickets have been extended and proved, they will be posted in the respective operation cost columns on the cost sheets. At the close of each month, or at the time when an order is completed, the overhead is to be figured upon the labor hours at the normal departmental rates and entered on the cost sheet. When overhead is entered on the cost sheets, it is also to be entered on a summary of overhead distributed, and the departmental totals are to be proved with the product of the total direct labor hours for each multiplied by the respective rates. If any material withdrawn for an order is unused when the order is completed, it will be reported on a transfer slip and its cost should be credited to the cost sheet. When an order is completed and all costs are entered on the cost sheet, they are to be added and the total entered on the transfer slip, which will report the total quantity made and delivered to the stockroom. The costs will then be reduced to a unit and posted to the comparative cost card. The cost sheet is then transferred to the completed file.

Transfer Slips

A transfer slip (Figure 16) is to be used to record the delivery of material from the production departments to the stockrooms. If raw material is withdrawn from the stockroom in excess of the amount required, the left-over material will be returned to the stockroom and reported on a transfer slip, on which the order number from which the material was taken is to be shown. The transfer slip is to be made in duplicate, and both copies are to be given to the stock-keeper as the material is delivered. The duplicate copy will be signed by the stock-keeper and returned to the foreman as a receipt for the

return of the material. The original copy should also be signed by the stock-keeper and delivered to the cost department. In the cost department the cost price will be entered on the transfer slips and credited to the cost sheet, and the quantity and unit cost will be posted to the stock record cards. The slips will then be filed according to order number for each stockroom.

When a production order is completed and the finished work delivered to the stockroom, it is to be reported on a transfer slip.

TRANSFER SLIP

DATE ..... 19..... T.S. No. .....

The following material has been transferred

TO ..... FROM .....

Part No.	Description	Quantity	Cost	
			Unit	Total

Charge Posted By .....

Signed .....

Credit Posted By .....

FIGURE 16.—Transfer Slip

In the cost department the total of the charges on the cost sheet will be entered on the transfer slip, and the quantity and unit cost are to be entered on the stock record cards.

At the close of each month the transfer slips for the materials delivered to the respective stockrooms are to be added. The respective stockroom accounts carried in the general ledger are to be charged with the total of the transfer slips for each and the grand total is to be credited to Work in Process.

COMPARATIVE COST RECORD

NAME OF PART _____ PART NO. _____

Date	Ord. No.	Quantities		Cost Per _____								Remarks
		Started	Finished	Material		Labor		Overhead		Total		

FIGURE 17.—Comparative Cost Record

Comparative Cost Record

A separate comparative cost record (Figure 17) is to be kept and filed for each part number, showing the unit costs of material, labor, and overhead for each order completed. The costs accumulated on the cost sheets are to be reduced to the unit basis and posted, as each order is closed, to the comparative cost records.

SHIPPING ORDER
(TRIPLICATE)

SHIP TO..... S.O. No.....
ADDRESS.....
SHIP VIA..... DATE.....

Part No.	Description	Quantity	Cost				√
			Unit		Total		

Date Shipped..... 19..... By.....

FIGURE 18.—Shipping Order

Shipping Orders

When orders are received from customers, shipping orders (Figure 18) are to be made in quadruplicate. The original is to remain in the office and the remaining three copies are to be delivered to the shipping clerk. The quadruplicate copy will be used by the shipping clerk as a packing slip, and the triplicate copy will be used as a requisition on the stock-keeper for the articles to be shipped. The shipping clerk will record the shipping data on the duplicate copy and send it to the accounting department, where the invoice will be made. The stock-keeper

will forward the triplicate copy to the cost department, and upon its receipt the stock records will be credited and the cost inserted on the shipping order.

The shipping orders will then be filed and the total at the close of each month will be credited to the Finished Product Stock account and charged to the Cost of Sales account.

REPAIR ORDER
(TRIPLICATE)

SHIP TO ..... S.O. NO. .....

ADDRESS .....

SHIP VIA ..... DATE .....

Part No.	Description	Quantity	Cost				√
			Unit		Total		

Date Shipped ..... 19 ..... By .....

FIGURE 19.—Repair Order

Repair Orders

When parts are ordered by customers, a repair order (Figure 19) is to be issued with shipping instructions, and also instructions as to whether the parts are to be charged or shipped gratis. The orders are handled in the same manner as the shipping orders, except that the parts are requisitioned from the finished parts stockroom instead of the finished product stockroom.

At the end of the month the total is credited to the Finished Parts Stock account and the charge is distributed between the

Cost of Sales—Repair Parts account and the Gratis Replacement account.

Monthly Journal Entries

The following journal entries are to be made at the close of each month in order to perpetuate the inventory figures, to control the cost records, and to prepare the accounts in the general books, so that the balances therein may be used, without further adjustment, in the preparation of the monthly financial and profit and loss statements.

Journal Entry No. 1

Dr.—Work in Process
    Cr.—Raw Materials—Stockroom No. 1
Total cost of raw materials withdrawn from stock for production, from summary of requisitions for the month.

Journal Entry No. 2

Dr.—Raw materials—Stockroom No. 1
    Cr.—Work in Process
Total unused materials returned to stock, from summary of transfer slips for the month.

Journal Entry No. 3

Dr.—Work in Process
    Cr.—Finished Parts—Stockroom No. 2
Total cost of parts and minor assemblies withdrawn for production, from summary of requisitions for the month.

Journal Entry No. 4

Dr.—Work in Process
    Cr.—Accrued Payroll
Total factory payrolls for the month.

Journal Entry No. 5

Dr.—Work in Process
    Cr.—Overhead Distributed—Department A
    Cr.—Overhead Distributed—Department B
    Cr.—Overhead Distributed—Department C
    Cr.—Overhead Distributed—Department D
Total overhead distributed to cost sheets during the month, from summary of overhead distributed.

Journal Entry No. 6

Dr.—Finished parts—Stockroom No. 2
    Cr.—Work in Process
Total cost of parts and minor assemblies completed and delivered to stock, from summary of transfer slips for the month.

Journal Entry No. 7

Dr.—Finished Product—Stockroom No. 3
    Cr.—Work in Process
Total product completed, from summary of transfer slips for the month.

Journal Entry No. 8

Dr.—Various Expense Accounts
    Cr.—Work in Process
To transfer charges during the month to standing orders to the accounts provided for same in the general ledger, from cost sheets.

Journal Entry No. 9

Dr.—Various Equipment Accounts
Dr.—Various Expense Accounts
    Cr.—Work in Process
Total cost of shop orders completed during the month, from summary of cost sheets.

Journal Entry No. 10

Dr.—Cost of Sales—Finished Product
    Cr.—Finished Product—Stockroom No. 3
Total cost of product sold and delivered to customers, from summary of shipping orders.

Journal Entry No. 11

Dr.—Cost of Sales—Repairs Parts
Dr.—Gratis Replacements
    Cr.—Finished Parts—Stockroom No. 2
Total cost of parts and minor assemblies shipped to customers, from summary of repair orders for the month.

Outline of Inventory Accounts

The posting of the foregoing entries to the inventory accounts outlined in the following is designated by the journal entry number. All other postings come from the books of original entry through the regular bookkeeping routine.

RAW MATERIAL—STOCKROOM NO. 1

Debit	*Credit*
Inventory at start of period.	Raw materials returned to shippers from whom purchased.
Purchase of raw materials.	Raw materials withdrawn for production, from requisitions for the month. (J. E. No. 1.)
Raw materials withdrawn for production but returned to the stockroom unused, from transfer slips for the month. (J. E. No. 2.)	

The balance at the close of each month in this account represents the cost of the raw material on hand in the raw material stockroom and should agree with the total cost of the respective materials shown on the individual stock record cards.

WORK IN PROCESS

Debit	*Credit*
Inventory at start of period.	Raw materials withdrawn for production but returned to the stockroom unused, from transfer slips for the month. (J. E. No. 2.)
Raw materials withdrawn for production, from requisitions for the month. (J. E. No. 1.)	Parts and minor assemblies completed during the month, from transfer slips. (J. E. No. 6.)
Parts and minor assemblies withdrawn for production, from summary of requisitions for the month. (J. E. No. 3.)	Product completed during the month, from transfer slips. (J. E. No. 7.)
Direct labor, from payrolls for the month. (J. E. No. 4.)	Charges to standing orders during the month, from cost sheets. (J. E. No. 8.)
Overhead distributed to cost sheets from summary for the month. (J. E. No. 5.)	Shop orders completed during the month, from cost sheets. (J. E. No. 9.)

The balance at the close of each month in this account represents the cost of all work in process of manufacture and should agree with the total of the balances on all cost sheets.

FINISHED PARTS—STOCKROOM NO. 2

Debit	*Credit*
Inventory at start of period.	Finished parts returned to shippers from whom purchased.
Purchases of finished parts.	Parts and minor assemblies withdrawn for production during the month, from requisitions. (J. E. No. 3.)
Parts and minor assemblies completed and delivered to stockroom during the month, from transfer slips. (J. E. No. 6.)	Parts shipped to customers for replacements during the month, from repair orders. (J. E. No. 11.)

The balance at the close of each month in this account represents the cost of the finished parts and minor assemblies on hand in the finished part stockroom, and should agree with the total cost of the respective materials shown on the individual stock record cards.

FINISHED PRODUCT—STOCKROOM NO. 3

Debit	*Credit*
Inventory at start of period.	Finished product shipped to customers during the month, from shipping orders. (J. E. No. 10.)
Product completed during the month, from transfer slips. (J. E. No. 7.)	

The balance at the close of each month in this account represents the cost of the finished product on hand in the finished product stockroom and should agree with the total cost of the respective materials shown on the individual stock record cards.

CHAPTER XIX

PROCESS COST SYSTEM ILLUSTRATED

Statement of Conditions

Foundry Discussed

In this chapter a foundry which makes only iron casting from patterns submitted by its customers is to be discussed. It does not stock any finished product for future sale. The castings are made as ordered by customers and are delivered to the customer immediately upon their completion.

Three Classes of Operations

The operations of the foundry may be grouped into three classes: namely, core-making, molding, and casting.

The time consumed in the core-making and molding operations will vary according to the design of the patterns and is not proportionate to the weight of the different castings. The employees performing these operations can conveniently account for the time which they consume on each kind of casting.

The casting operation includes the melting and pouring of the metals, and also the subsequent operations preparing the castings for delivery. One batch of metal may be poured into molds for various sizes and shapes of castings. During the process the employees cannot determine the material or time consumed in the manufacture of each kind of the castings made. Neither is it practical for the foundry employees to attempt to distribute their time to the respective orders worked on while cutting off gates, tumbling, and cleaning castings.

System Instructions

The Inventory to Start

The operation of the cost system is to start on the first day of the month. Just prior thereto all completed castings should be delivered and billed to customers. A complete inventory of the raw materials and scrap should be taken as of the first day of the month. They should be fully described on the inventory records and priced at invoice costs plus freight.

The general books should be closed and the merchandise accounts adjusted to the new inventory figures.

General Outline of System

Reporting Labor and Material Costs. When castings are ordered by customers, production orders are to be issued to the foundry for their manufacture. The foundry foreman, who will also supervise the molders, will be given a copy of all production orders, and if cores are required for the castings an additional copy of the production order will be given to the foreman of the core-making department. The core-making department will proceed with the manufacture of the cores, and the employees performing the work will charge the time thus consumed to the production order numbers on which they work. The foundry foreman will then assign the work required on the various production orders to the molders who will also charge their time to the production order numbers on which they work.

The cost of the metal poured into the molds is to be found for the process and distributed to the different kinds of castings made in proportion to their weight. The order method will be used for obtaining all other costs.

Shop orders will be issued for making special repairs, improvements, betterments, and new equipment. Standing orders will be issued for the cupola operations and the indirect labor activities. The time of the employees working on these orders should be charged to the shop or standing order number.

Each employee in the foundry will account for the total time which he works each day and report the number of hours which he works on each production order while molding or making cores, and on each shop and standing order while performing other operations.

The foundry foreman will report daily all materials used in the cupola. After the metal is poured, he will also report daily the finished weight of all castings made on each production order and the total weight of all bad castings, gates, and scrap recovered from the metal poured during the day.

Stock Records and Cost Sheets. In the cost department a stock record card will be opened for each kind of material used in the cupola. The quantity and unit cost of each kind of material on hand at the first of the month will be posted from the inventory records. Subsequent purchases will be posted from receiving slips and if any material is returned to the shipper, the stock record will be credited from return purchase slips.

Cost sheets will be opened for all orders issued to the foundry. The total charges for each month to the standing orders will be transferred to the corresponding expense accounts in the general ledger. The charges to the shop orders will be transferred upon completion of the work to the asset or expense accounts, as the case may be, to which they should be posted in the general ledger.

The time tickets of the employees will be proved daily with the clock cards. The rate of pay will be inserted, and the wages for each order number will be extended. The total wages figured on the time tickets will be proved with the payroll records. The time tickets will then be posted to the cost sheets for the order numbers designated on the time tickets by the employees.

The only labor postings which will be made to the cost sheets for production orders will be for core-making and mold-

ing. Columns are provided on the cost sheet in which the labor cost of these operations may be segregated as they are posted from the time tickets. At the close of each month, or when an order is completed, the overhead is to be figured on the labor hours for core-making and molding at the normal rates for the respective departments and posted to the cost sheets and to the summary of overhead distributed.

The stock record cards will be credited daily with the material used as reported by the foundry foreman. When this posting is made, the foreman's report will be priced at the cost shown on the stock record cards and extended. The total weight of bad castings, gates, and scrap recovered from the metal poured will be charged to the stock record card for scrap metal and priced at its scrap value. The value of the scrap thus recovered during the day will be deducted from the cost of the materials used. To the balance or net cost of the materials there will be added the normal labor and overhead costs in connection with the cupola, and the total will then be the cost of the good castings made during the day. This total will be divided by the total weight of all good castings poured, as reported by the foreman, to obtain the cost per pound. The weight of the castings made on each production order will then be multiplied by the cost per pound, and the result will be entered and proved in total on the report of castings finished, from which the postings will be made to the cost sheets for the respective orders.

When castings are delivered to customers, the core-making and molding labor, and overhead costs will be added to the cost of the metal poured, as entered on the cost sheets, and the total will then be credited to the cost sheets and entered on the shipping order to be charged as the manufacturing cost of the sales. When an order is completed, the credits should balance the charges, and the cost sheet should be withdrawn from the active files.

Description of Forms

Classes of Orders

All work performed in the foundry is to be authorized by a written order. There will be provided three classes of orders: namely, production orders, shop orders, and standing orders. The numbers on these orders will be used by the employees to designate the cost sheet to which their time should be charged. The total labor distribution will be made by order number. The production orders will be numbered consecutively as issued from 5001 up. The shop orders will be numbered consecutively as issued from 1000 to 5000. The standing orders and their numbers are listed under the caption of "Standing Orders."

Production Orders

When castings are ordered by customers, production orders are to be issued to the foundry for their manufacture. When a customer orders a quantity of a certain casting which will require two or three months to make, two or three production orders should be issued to the foundry so that the quantity on each order may be completed at least within a month from the date on which the first casting was made on each order. When a customer orders a large quantity of more than one kind of casting, separate production orders should be issued for each. At any time when a customer orders more than one kind of casting and it is desired to obtain the cost of each kind, a separate production order should be issued for each. However, if an order is received for a small lot of a variety of castings and the costs of the respective kinds of castings are not desired, one production order may be issued for the lot.

The production orders are to be made in quadruplicate. The original copy is to remain in the production department; the duplicate will be given to the foundry foreman; the triplicate to the foreman of the core department; and the quadruplicate

to the cost department. Upon the completion of an order the foremen will send their copies to the cost department.

Shop Orders

When repairs of any importance to the building or equipment are to be made, or when any special work is to be done by the foundry, shop orders are to be issued with full instructions thereon. These orders are to be issued in quadruplicate—the original is to remain in the production department; the duplicate is to be issued to the foundry foreman; the triplicate to the foreman of the core department; and the quadruplicate is to be sent to the cost department.

Standing Orders

The following list of standing orders is to be given to each foreman and to the cost department:

Order No. 100—Charge all time of operating the cupola to this order number.

Order No. 101—Charge all time of cutting off gates, tumbling, cleaning, and inspecting castings to this order number.

Order No. 102—Charge all time of unloading incoming materials to this order number.

Order No. 103—Charge all time of sweeping and cleaning foundry to this order number.

Order No. 104—Charge all time of making minor repairs to building to this order number.

Order No. 105—Charge all time of making minor repairs to equipment to this order number.

Order No. 106—Charge all time of crating and loading shipments to customers to this order number.

Order No. 107—Charge all miscellaneous indirect labor which cannot be classified under the foregoing numbers to this order number.

Stock Record Cards

A separate stock record card (see Figure 10, page 173) will be headed for each kind of raw material and used to perpetuate the inventory. The quantity and unit price of all materials shown on the inventory as of the first of the month will be posted to the respective stock record cards. The debits, or additions, to these cards will be made from receiving slips on which the receipt of purchases will be recorded, and from the daily report of the foundry foreman, on which he will record the total scrap recovered from the metal poured. The credits or deductions from the balance on the stock record cards will be made from the daily report of the foundry foreman on which he will record the materials used, and from return purchase slips, on which will be reported the materials returned to shippers.

When posting charges to the stock record cards the unit cost, including freight, is also to be entered, and when posting credits, the unit cost shown on the stock record cards is to be entered on the report from which the posting is made.

The total cost of raw materials on hand which have been inventoried as of the first day of the month is to be the opening entry in the Raw Material account. This account will be a controlling account for the stock record cards and will, at the close of each month, represent the total inventory value of the raw material on hand and will agree with the total value of the respective materials shown on the individual stock record cards. The entries to this account are described under the forms from which they originate.

Receiving Slip

A separate receiving slip (see Figure 11, page 175) made in duplicate, is to be used to report all raw materials received on each purchase order number. Both copies are to be delivered to the office where the duplicate will remain to be attached to

the invoice. The unit prices, including freight, are to be entered on the original, which is then to be delivered to the cost department. The quantities and unit costs are to be posted therefrom to the stock record card, indicating also the receiving slip number in the reference column. The original is then to be filed according to number in the cost department for reference.

The charges to the Raw Material account in the general ledger for purchases are to be made from the purchase record. No entry is to be made from the receiving slip to the general ledger.

Return Purchase Slip

All materials returned to a shipper are to be recorded on a return purchase slip (see Figure 12, page 176) which is to be made in quadruplicate and numbered serially. The quadruplicate copy is to remain in the office, and the remaining three copies are to be delivered to the shipping clerk. The triplicate copy will be used as a packing slip, the duplicate as the shipping clerk's report to the office of the details in regard to the shipment, from which the invoice will be made, and the original will be used as a requisition and credited to the stock records.

The credit to the Raw Material account in the general ledger for materials returned to shippers is to be made from the original and the difference between the costs including freight and the invoice or purchase price is to be charged to the Undistributed Freight account.

Report of Material Used

The foundry foreman will report daily (Figure 20) all materials used in the cupola. The stock record cards will be credited with the quantity of the respective materials thus reported and the unit costs will be entered on the report as the postings are made to the stock record cards. The total cost of each material used will then be entered and the report totaled.

At the bottom of the report the foreman will record the total weight of all bad castings, gates, and scrap recovered from the metal poured during the day, and this will be debited to the stock record card for scrap. The cost value of the scrap per

REPORT OF MATERIAL USED

BY..... DATE..... 19.....

Description	Weight	Cost	
		Unit	Total
Totals			
Scrap Recovered			
Net Cost of Material			
Labor			
Overhead			
Total Cost			
Weight of Castings Produced			
Cost per Lb.			

FIGURE 20.—Report of Material Used

pound will be entered on the stock record card and also on the report. The total value of the scrap recovered is to be deducted from the total cost of the material used, and the balance will represent the net cost of the materials in the finished castings. The normal cost of labor and overhead for operating the cupola

to produce the weight of finished castings made during the day will then be added to the net cost of the materials to determine the total cost of the finished castings produced. This total will then be divided by the total weight of the finished castings to acquire the unit cost per pound, and be prorated to each productive order on the report of finished castings in proportion to the weight of the finished castings made on each order.

These reports are to be filed according to date and summarized for each month. The total cost of the materials used is to be charged to the Work in Process account and credited to the Raw Material account. The total cost value of scrap recovered from the metal poured during the month is to be charged to the Raw Material account and credited to the Work in Process account. The total overhead absorbed in the finished castings during the month is to be charged to Work in Process and credited to the account for Overhead Distributed—Cupola, from the summary of overhead distributed.

Report of Weight and Finished Castings

The foundry foreman will report daily (Figure 21) the weight of all good castings made on each production order. The weights recorded on this report are to be those after the castings have been cleaned and prepared for delivery to customers. The number of pounds reported for each production order number is to be multiplied by the unit costs as found on the report of materials used, and the product is to be entered on this report as the total charge against each production order. The total of these charges must agree with the total cost shown on the daily report of material used. The charge against each production order is then to be posted to the respective cost sheets. The reports are then to be filed according to date.

No entry is required in the general ledger for the figures on this report.

REPORT OF FINISHED CASTINGS

COST PER LB..... DATE..... 19.....

Order No.	No. Castings	Weight	Total Cost		√

FIGURE 21.—Report of Finished Castings

Time Tickets

A daily time report (Figure 22) is to be made by each employee and approved by the departmental foreman. The total time that each employee works during the day must be fully accounted for and checked with the clock cards. Order numbers have been provided for all work to be performed by employees, and they should show on their time tickets the number of hours which they have worked on each order number during the day. In the office the rate of pay will be entered on

the time tickets, the wages will then be extended for the time consumed on each order number, and the total will be proved with the payroll. The tickets are then to be filed according to order number, and a summary of the charges for each is to be made for each pay period and posted to the respective cost sheets. The time tickets are then to be filed for future reference.

A separate payroll will be prepared for all foundry employees except foremen, who will not be required to report the distribution of their time. The total foundry payroll for each

TIME TICKET

DEPT..... DATE..... ORDER NO. .....

Time: Finished / Started	Hours	Rate	Amount

Quan. Completed	Operation

Emp. No.	Emp. Name

O.K'd By

FIGURE 22.—Daily Time Ticket

month is to be charged to the Work in Process account and credited to the Accrued Payroll account.

Cost Sheets

A separate cost sheet (Figure 23) is to be used to accumulate the cost of each order number. As each order is completed the cost sheet is to be withdrawn from the active binder and filed. The cost of the metals poured is to be charged from the daily reports of the materials used. Purchases made directly for shop orders are to be charged from the invoices received. All labor is to be charged from the employees' time tickets. The overhead is to be figured on the labor postings

COST SHEET

CUSTOMER'S NAME_____ ORDER NO._____

DESCRIPTION OF WORK_____ QUANTITY ORDERED_____

QUANTITY COMPLETED_____

LABOR COSTS														METAL COST				DELIVERIES AND SUMMARY		
CORE-MAKING						MOLDING														
Date	Emp. No.	Quan.	Hours	Wages	Overhead	Date	Emp. No.	Quan.	Hours	Wages	Overhead			Date	No. of Castings	Weight	Cost	Date	Inv. No.	Cost

to the cost sheets, either when the orders are completed or at the close of the month. The costs of all castings completed and delivered to customers are to be credited to the cost sheets.

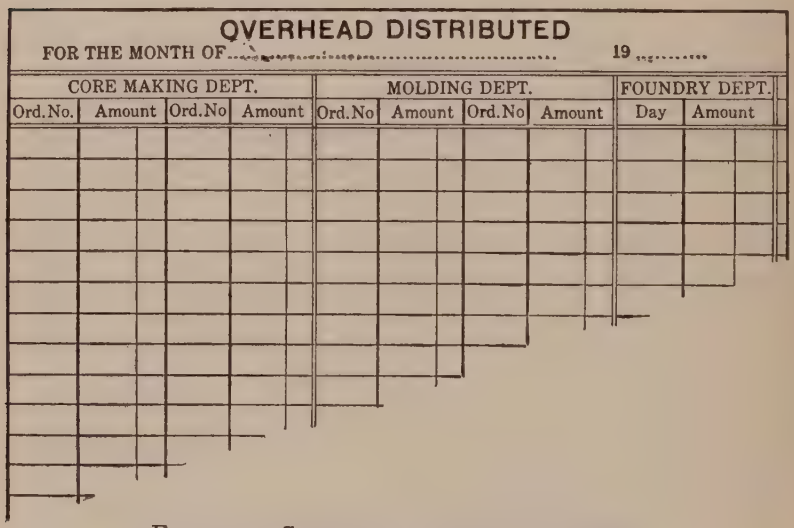
A controlling account will be carried in the general ledger for the work in process, which will represent the total of the balances on all cost sheets at the close of each month. The entries to this account are described under the forms from which they originate.

Summary of Overhead Distributed

All expense accounts of the foundry are to be allocated to the respective departments. The overhead for the molding and core-making departments is to be apportioned to the work performed upon the basis of the direct labor hours at the rates found for normal operations. For convenience in calculating the cost of metals poured, the direct labor charges against the cupola will be included in the overhead statement with the expense charges so that both may be apportioned to the work performed in one figure. The normal rate to be used for distributing the cupola costs will be found by dividing the normal charges by the finished weight of castings produced under normal conditions.

The overhead absorbed by the production of each department is to be summarized for the month (Figure 24). As the overhead is entered on the daily report of material used, it is also to be entered on this summary. When production orders are completed during the month, the overhead for the molding and core-making departments is to be figured upon the labor hours of the current month, and entered on the cost sheet and this summary. At the close of each month the overhead on the labor for the current month on uncompleted orders is likewise to be entered on the cost sheets and on this summary. The summary is then added and the total for each of the three departments is to be proved. The total for the foundry

department should equal the product of the total weight of finished castings produced during the month by the normal rate of overhead per pound. The totals of the molding and core-making departments should equal the product of the total direct labor hours, as shown by the payroll summary, multiplied by the normal overhead rates for the respective departments.



OVERHEAD DISTRIBUTED

FOR THE MONTH OF..... 19.....

CORE MAKING DEPT.				MOLDING DEPT.				FOUNDRY DEPT.	
Ord.No.	Amount	Ord.No	Amount	Ord.No	Amount	Ord.No	Amount	Day	Amount

FIGURE 24.—Summary of Overhead Distributed

The grand total of the three departments is to be charged to the Work in Process account, and the total for each department is to be credited to the overhead distributed accounts for the respective departments.

Shipping Reports

Shipping reports (Figure 25) numbered consecutively are to be made in quadruplicate by the shipping clerks for each shipment made to customers. The original copy is to be sent to the office and used for billing purposes. The duplicate is to

be delivered to the cost department where the cost of the castings will be entered on the report and also credited to the cost sheets. The duplicates will be summarized and the total for each month will be debited to the Cost of Sales account and credited to the Work in Process account. The triplicate copy

SHIPPING REPORT

DELIVERED TO..... S.R. NO.....

ADDRESS.....

VIA..... DATE..... 19....

From Order No.	Description	Quantity	Cost				
			Unit		Total		

By.....

FIGURE 25.—Shipping Report

will be used as a packing slip and delivered to the customer with the shipment. The quadruplicate copy will be held by the shipping clerk for his reference.

MONTHLY JOURNAL ENTRIES

The following journal entries are to be made at the close of each month in order to compute the inventory figures, to control the cost records, and to prepare the accounts in the general books so that the balances therein may be used, without further adjustment, in the preparation of the monthly financial and profit and loss statements:

Journal Entry No. 1

Dr.—Work in Process
Dr.—Raw Material
    Cr.—Raw Material

To charge, from summary of reports of materials used, Work in Process with the net cost of raw materials used in castings, to charge Raw Material account with the gates and scrap recovered from the metal poured and to credit Raw Material with the total cost of materials used in the cupola during the month.

Journal Entry No. 2

Dr.—Work in Process
    Cr.—Accrued Payroll

Total foundry payrolls for the month.

Journal Entry No. 3

Dr.—Work in Process
    Cr.—Overhead Distributed—Cupola

Overhead absorbed in cost of metal poured, from summary of reports of material used.

Journal Entry No. 4

Dr.—Work in Process
    Cr.—Overhead Distributed—Molding Department
    Cr.—Overhead Distributed—Core-Making Department

Total overhead distributed to cost sheets on productive labor hours in the respective departments for the month, from summary of overhead distributed.

Journal Entry No. 5

Dr.—Various Equipment Accounts
Dr.—Various Expense Accounts
    Cr.—Work in Process

Total cost of shop orders completed during the month, from summary of cost sheets.

Journal Entry No. 6

Dr.—Various Expense Accounts
    Cr.—Work in Process

To transfer total charges during the month to standing orders to the accounts provided in the general ledger.

Journal Entry No. 7

Dr.—Cost of Sales
    Cr.—Work in Process

Total cost of castings completed and delivered to customers, from summary of shipping reports for the month.

Outline of Ledger Accounts

The posting of the foregoing entries to the inventory accounts outlined in the following is designated by the journal entry number. All other postings come from the books of original entry through the regular bookkeeping routine.

Raw Material

Debit	*Credit*
Inventory at start of period.	Raw materials returned to shipper from whom purchased.
Purchase of raw materials.	Raw materials withdrawn for use in the cupola during the month, from reports of materials used. (J. E. No. 1.)
Gates and scrap recovered from metal poured during the month, from reports of materials used. (J. E. No. 1.)	

The balance at the close of each month in this account represents the cost of the raw material on hand in the raw material stockroom and should agree with the total cost of the respective materials shown on the individual stock record cards.

Work in Process Account

Debit	*Credit*
Inventory at start of period.	Shop orders completed during the month, from summary of cost sheet. (J. E. No. 5.)
Purchases made for and charged directly to shop orders.	Charges to standing orders, from cost sheets. (J. E. No. 6.)
Raw materials withdrawn for use in the cupola during the month, from reports of materials used. (J. E. No. 1.)	Castings completed and delivered to customers, from summary of shipping reports for the month. (J. E. No. 7.)
Foundry payrolls. (J. E. No. 2.)	
Overhead absorbed in cost of metal poured, from summary of reports of material used for the month. (J. E. No. 3.)	
Overhead absorbed in molding and core-making departments, from summary of overhead distributed. (J. E. No. 4.)	

The balance at the close of each month in this account represents the cost of all work in process of manufacture and should agree with the total of the balances on all cost sheets.

CHAPTER XX

OPERATING UNIT COST SYSTEM ILLUSTRATED

Statement of Conditions

Operations Classified

The factory under discussion in this chapter manufactures an article in four different styles from one grade of cloth. Each style of the finished article requires six operations for its manufacture, and it was found that there was a total of only eight different operations for all styles. Only two of the operations which were performed on all styles required more time for two of the styles than it did for the others, and therefore, these two operations were subdivided into four operations, increasing the classification to ten operations. The operations were accordingly numbered from 1 to 10. The symbol number for the operations required for the manufacture of each style of finished article is shown in the following schedule under the style number for each article.

Style Numbers	510	520	530	540
Operation Numbers	1	1	1	1
	2	–	2	–
	–	3	–	3
	4	4	–	4
	–	–	–	5
	6	6	–	–
	–	–	7	7
	–	8	8	–
	9	–	9	–
	10	10	10	10

Operation No. 1 represented the cutting of the material and the remaining operations represented sewing operations. Each style of article required a different quantity of material for its manufacture.

There were two large departments in the factory—the cutting department and the sewing department. It was found that it required no more time to cut the material for one style of the finished article than it did for another. Therefore, the cutting cost was the same per article for all styles. The sewing operations for each style of finished article are shown in the foregoing schedule. Operations No. 2 and No. 3 are alike but require more time to complete on styles 520 and 540 than they do on styles 510 and 530. Operations No. 6 and No. 7 are also alike but require more time to complete on styles 530 and 540 than on styles 510 and 520. Operation No. 4 is not performed on style 530; operation No. 5 is performed only on style 540, and so on.

Stockrooms

A stockroom was provided for the raw material, adjacent to the cutting department, and another stockroom was provided adjacent to the sewing department for the finished articles and for thread and other sewing machine supplies.

The articles were made in lots of five dozen each. A process stockroom was located centrally in the sewing department from which all work was distributed to the sewing machine operators and to which it was returned upon the completion of each operation upon a lot.

System Instructions

The Inventory to Start

The operation of the cost system is to start on the first day of the month. Just prior thereto the material should be ar-

ranged to facilitate the work of taking a complete inventory of the merchandise, and as much of the work in process should be completed as is possible.

The inventory should be taken as of the first day of the month and summarized according to the following classification:

1—Raw materials in stockroom No. 1
2—Finished articles in stockroom No. 2
3—Work in process

The general instructions for taking the inventory of each of the above classes of material are as follows:

1. Only the raw materials actually in stockroom No. 1 should be classified as the raw material inventory. They should be priced at invoice cost. As only one kind of raw material is used in the factory, a record of the quantity as well as the cost will be carried only in a ledger account.

2. Only the finished articles, thread and sewing machine supplies actually in stockroom No. 2 should be included in this classification of the inventory. The supplies should be priced at invoice cost; and the finished articles should be priced at the estimated cost of their manufacture, including the cost of the raw material used, the estimated cost of the labor operations performed, and the overhead thereon.

3. Only the materials cut or in process of manufacture should be classified as the work in process inventory. They should be fully described on the inventory records, showing the style number of the completed article into which they will eventually be made, and the symbol number of the last operation performed thereon. This inventory is to be summarized in such a manner as to show the total quantity of raw material used in each of the styles in process and the total quantity which has passed through each of the respective labor operations. The summary should be prepared so that the description of the work in process may be listed at the extreme left, and in the first

column to the right the quantity on hand should be shown. The next four columns should be used to compute the amount and cost of the raw material in process, using a separate column to segregate the quantity of each style. To the right of the material columns, nine columns should be headed for the operations which may have been performed. The quantity of each of the items appearing on the inventory is then extended in one of the four material columns, and also in each of the columns for operations performed on the item inventoried. The summary is then to be totaled and the total quantity for each style in the material columns is to be multiplied by the unit cost of the material used per article, and the product inserted on the last line of the summary as the inventory value. The total of each of the operation columns is to be multiplied by the unit labor cost for the respective operations, and the product entered on the same line with the material costs. The overhead is to be figured upon the basis of the labor cost, using the normal percentages for the respective departments.

The general books should be closed and the merchandise accounts adjusted to the new inventory figures.

General Outline of System

Production Orders. The production requirements will be figured from customers' orders, as in the past, and the superintendent will continue to issue the same form of production orders to the cutting department for the quantity and style of articles to be manufactured. As the costs are not to be acquired for each order, no use at any time is made of the production order number in the cost records.

Production Record. The quantity of material cut for each style of the finished articles is to be reported daily by the cutting department. When the material is cut, the cutters will tie it in bundles containing the pieces necessary to make five dozen completed articles and deliver them to the process stock-

keeper. The cutters will charge their time to the operation number for their department.

The process stock-keeper will distribute the work to the sewing machine operators. Upon the completion of an operation for a bundle, the operator will return it to the process stock-keeper and receive a new bundle. Each sewing machine operator specializes in and performs only one kind of an operation. As the work is received in the process stockroom upon the completion of each operation, the stock-keeper will make a record of the quantity which he receives. This production record consists merely of a tally sheet with columns provided for the four styles of the finished articles which have been cut, and with columns for the eight sewing machine operations, in which the respective styles are disregarded. The record is to be totaled daily and delivered to the cost department where the daily records are to be summarized for the month in order to determine the production in each operation.

Upon the completion of the final sewing machine operation, the articles are to be delivered to the finished stockroom where a record is to be kept of all receipts, showing the quantity of each style received. These reports are to be sent to the cost department daily and summarized monthly.

All employees performing other than productive work will charge the time thus employed to the standing or shop order number on which they have worked. All employees performing direct operations upon the product will charge the time thus consumed to the operation number.

The total quantity produced, as shown by the production report, divided into the total wages paid for each operation, as shown by the summary of time tickets, will give the unit cost of performing each operation.

Cost Sheets. Cost sheets are to be opened for each shop order issued. The materials used are to be charged from the purchase invoices. The labor is to be posted from the time

tickets and the overhead is to be figured at the normal percentages for the respective departments, crediting the overhead cost sheets with the amount as computed. When the work is completed on a shop order, the total charges are to be transferred to the general ledger account under which the work may be classified.

Material cost sheets are to be opened for each of the finished articles, and labor cost sheets are to be opened for each of the ten labor operations. The first posting to the cost sheets is to be made from the inventory which was taken as of the first of the month. Both the quantities and costs are to be posted. At the close of the month, the report of material used is to be cost-priced and posted to the material cost sheets for the respective styles of the finished article. The quantity of each style cut is to be posted from the summary of the production reports submitted by the process stock-keeper. The material cost sheets are then totaled and the average cost per article is found for the quantity then in process.

The wages paid to employees for performing the various labor operations on the product will be posted from the payroll distribution, which will be made from the summary of the employees' time tickets. The quantity produced in each operation will be posted from the summary of the production reports submitted by the process stock-keeper and the finished stock keeper. The postings to the labor cost sheets are then totaled and divided by the quantity produced in order to determine the unit cost per article.

The overhead on the inventory is to be posted to the departmental overhead cost sheets. At the close of each month the overhead absorbed by the productive labor performed during the month is to be posted to the overhead cost sheets for the respective departments. The balance on the overhead cost sheets will always remain the same normal percentage of the direct labor in process.

Cost Summary. A cost summary is to be prepared monthly for each style of the finished articles. The quantity completed, as reported by the finished stock keeper, is entered in the space provided at the top of the summary. The specifications of the finished article are entered at the left of the summary. The unit costs, as shown on the respective material and labor cost sheets, are then entered in the first column and the cost for the total quantity is computed and entered in the second column, and credited to the respective material and labor cost sheets. The normal percentage of the labor cost in each department is then added for overhead, and is credited to the respective overhead cost sheets. The two columns on the summary are then added to determine the unit and total cost of the article completed during the month. The quantity thus completed and the unit costs are then to be entered on the finished stock record cards.

Sales Summary. A summary of the sales is to be made each month showing the total quantity of each style of the finished articles shipped. These totals are to be credited to the finished stock record cards for the respective styles of the finished articles, and the unit cost, as shown by the stock record cards, is to be entered on the sales summary. The total cost of the articles shipped is then to be computed and charged to the Cost of Sales account, crediting the Finished Stock account.

Description of Forms

Shop Orders

When repairs of any importance to the building or equipment are to be made, or when any special work is to be done in the factory, shop orders are to be issued with full instructions thereon. These orders are to be issued in quadruplicate. The original is to remain in the superintendent's office, the duplicate is to be issued to the foreman of the cutting department, and the triplicate is to be issued to the foreman of the sewing

machine department, describing the work to be performed in the respective departments, and the quadruplicate is to be sent to the cost department.

Standing Orders

The following list of standing orders is to be given to each foreman and to the cost department:

Order No. 100—Charge all time of stock-keeping and receiving materials in stock to this order number.

Order No. 101—Charge all time of trucking materials to this order number.

Order No. 102—Charge all time of inspecting materials and work performed in the factory to this order number.

Order No. 103—Charge all time of sweeping and cleaning to this order number.

Order No. 104—Charge all time of making minor repairs to building to this order number.

Order No. 105—Charge all time of making minor repairs to machinery to this order number.

Order No. 106—Charge all time of salvaging and reworking materials spoiled by employees in the factory to this order number.

Order No. 107—Charge all time of crating and shipping articles to customers to this order number.

Order No. 108—Charge all time of miscellaneous indirect labor which cannot be classified under the foregoing orders to this number.

Raw Material Stock Records

As only one kind of raw material is to be used, the quantity of the raw material received and issued is to be entered with the cost in the ledger account. The account is to be debited with the purchases and credited with the returned purchases. The materials used in production are to be credited to the account from the report of materials cut, and charged to the Work in Process account.

Finished Stock Records

A separate stock record (Figure 26) is to be kept for each of the four styles of the finished article, on which the quantity and cost of all postings are to be shown. The quantity and cost of the articles shown on the inventory as of the first of the month are to be posted to the respective records. The debits or additions to these records will be made from the cost summary for each style of article manufactured during the month. The credits or deductions from the balance on these stock records will be made from the cost of sales summary.

A separate stock record is also to be kept for each kind of thread and other supplies carried in the finished stockroom. The quantity and cost of each on hand at the first of the month are to be posted from the inventory records. The subsequent purchases are to be posted from the invoices, and the supplies used are to be credited from the report of supplies used. At the close of each month the balance on the respective records will show the quantity and cost of the supplies on hand in the finished stockroom.

A controlling account for the finished articles and supplies in stock will be carried in the general ledger. It will be debited with the total cost of all styles of finished articles on hand on the first of the month from the inventory records. It will also be debited with the total cost from the summaries of all articles completed and delivered to the finished stockroom each month. It will be credited from the sales summaries with the total cost of all articles sold during the month.

The inventory of supplies as of the first of the month is also to be debited to the controlling account for the finished stockroom. The subsequent purchases will be debited to the controlling account from the purchase invoices, and the total cost of all supplies withdrawn from the finished stockroom will be credited to the controlling account from the monthly summary of the reports of supplies used.

STOCK RECORD

DESCRIPTION ..... NO. .....

LOCATION ..... MAX. ..... MIN. .....

Date	Reference	Unit Cost	Quantities			Costs		
			Received	Issued	Balance	Received	Issued	Balance

FIGURE 26.—Stock Record

Receiving Slip

Separate receiving slips (Figure 27), numbered in sequence, are to be used to report all raw materials received on each purchase order number. They will be delivered to the office where they will be checked with the invoices and attached thereto.

The charges to the Raw Material account for purchases are to be made from the purchase record. No entry is to be made from the receiving slip.

RECEIVING SLIP

DATE ..... 19 ..... R.S. NO. .....

RECEIVED FROM ..... PUR. ORD. NO. .....

ADDRESS ..... VIA .....

Quantity	Description	Condition

Delivered By ..... Checked By .....

FIGURE 27.—Receiving Slip

Return Purchase Slip

All materials returned to shippers are to be recorded on return purchase slips (see Figure 12, page 176) which are to be numbered serially, and which are to be delivered to the office, where invoices will be made against the original shippers.

The credit to the Raw Material account for materials returned to shippers is to be made from the office invoices. No entry is to be made from the return purchase slip.

Report of Material Cut

The cutters will report daily the quantity of material cut for each style of article. These reports (Figure 28) are to be summarized and totaled for each month. They are then to be cost-priced, and the total cost of the material cut for each style of article is to be posted to the material cost sheets for the respective articles.

The total cost of all material cut is to be charged to the Work in Process account and credited to the Raw Material account.

REPORT OF MATERIAL CUT

BY..... DATE .....

Style Cut	Yards Used	Dozens Cut

FIGURE 28.—Report of Material Cut

Report of Supplies Used

Whenever supplies are withdrawn from the finished stock-room for use in the sewing machine department, the finished stock-keeper will make a report (Figure 29) thereof and have it signed by the department foreman. These reports should be delivered promptly to the cost department, where they will be priced and credited to the respective stock records for supplies.

They are to be summarized and the total for each month is to be charged to the Supply Expense account and credited to the Finished Stock account.

Time Tickets

Each employee is to account for his entire time during the day. A separate time ticket (see Figure 22, page 201) is to be used to report the time which is to be charged to each order or operation number worked on. The total time recorded on the individual time tickets is to be checked with the clock cards daily. The employees' rates are to be inserted on the time

REPORT OF SUPPLIES USED

DATE ..... 19 ..... ORD. NO. .....
DEPT. .....

Description	Quantity	Cost				✓
		Unit		Total		

Posted By ..... Signed By .....

FIGURE 29.—Report of Supplies Used

tickets, and the wages will then be extended for the time consumed on each order or operation number, and the total of all tickets proved with the payroll. The tickets are then to be filed according to order or operation number, and at the close of each month an adding machine list is to be made of the wages to be charged to each number. The total of the monthly charges is to be proved with the payroll records. The total for each shop order and operation is to be posted to the respective cost sheets.

A separate payroll should be prepared for all factory em-

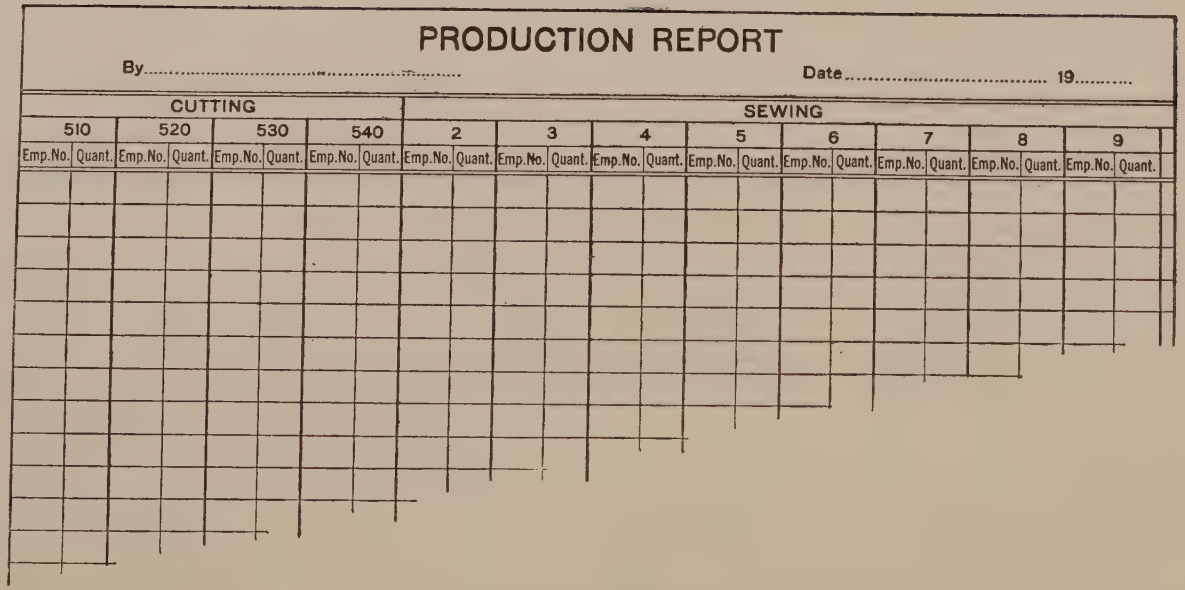
ployees except foremen, who will not be required to report the distribution of their time. The monthly summary of the charges to the various order and operation numbers should be arranged so that sub-totals may be obtained of the direct labor in the cutting and sewing machine departments. The charges to the standing orders are to be debited to the corresponding ledger accounts; the charges to shop order and operation numbers are to be debited to the Work in Process account; and the total payroll is to be credited to the Accrued Payroll account.

Production Record

The process stock-keeper will make a daily production (Figure 30) report of the quantity of articles completed in each operation. This report consists merely of a tally sheet with columns provided for the four styles of the finished articles which have been cut, and with columns for all but the last sewing machine operation, in which the respective styles are disregarded. As each bundle of work is received by the stock-keeper upon the completion of each operation, he will record it in the column headed for the operation just completed. The cutting operation is subdivided according to the style of the articles cut, so that the unit cost of the materials used for each style may be computed. These sheets are totaled daily and summarized for each month. The monthly totals are posted to the respective cost sheets as described under the caption of "Cost Sheets."

Report of Articles Completed

The finished stock keeper will make a daily report (Figure 31) of the quantity of each style of finished articles which he receives in stock. In the cost department these reports will be summarized so as to determine the total of each style received during the month. These totals are to be entered on the cost summary for articles completed.



PRODUCTION REPORT

By..... Date..... 19.....

CUTTING								SEWING															
510		520		530		540		2		3		4		5		6		7		8		9	
Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.	Emp.No.	Quant.

FIGURE 30.—Production Report

Cost Sheets

A separate cost sheet (Figure 32) is to be opened for the material cost of each of the four styles of finished articles. The cost of the material and the number of finished articles to be made from the material are to be posted to the cost sheets from the inventory taken just prior to the inauguration of the system. At the close of each month the total cost of all material cut for each style of article is to be posted from the report of

REPORT OF ARTICLES COMPLETED

BY..... DATE ..... 19.....

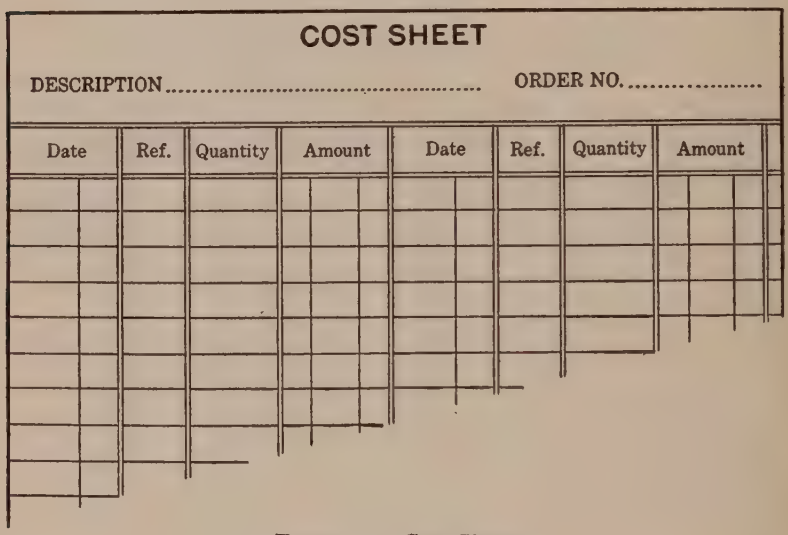
510		520		530		540	
Emp.No.	Quantity	Emp.No.	Quantity	Emp.No.	Quantity	Emp.No.	Quantity

FIGURE 31.—Report of Articles Completed

materials cut. The quantity of articles to be made from the material cut is to be posted at the close of each month from the summary of the production reports submitted by the process stock-keeper. The cost sheets are then totaled and the average cost per unit is found. When preparing the cost summary for finished articles, the material cost sheets are to be credited with the quantity and cost of the articles completed during the month. The balances then on the material cost sheets will represent the

quantity and cost of the materials cut and in process of manufacture, exclusive of all other cost.

A labor cost sheet is to be opened for each of the ten labor operations. The quantity of articles completed in each operation and the labor cost at the first of the month is to be posted from the inventory record. The wages paid to all employees while performing the respective operations are to be charged to the labor cost sheets from the monthly summary of the payrolls.


COST SHEET

DESCRIPTION..... ORDER NO.....

Date	Ref.	Quantity	Amount	Date	Ref.	Quantity	Amount

FIGURE 32.—Cost Sheet

The quantity completed in each operation is to be posted from the production report prepared by the process stock-keeper. The postings are then to be totaled and the average operation cost per article found. When preparing the cost summary for finished articles, the labor cost sheets are to be credited with the quantity and cost of the articles completed during the month. The balances then on the labor cost sheets will represent the quantity and cost of the operations completed on work that is still in process of manufacture.

Overhead cost sheets are to be opened for the overhead

absorbed by the work performed in each of the two departments. The overhead on the labor cost of the work in process of manufacture at the first of the month is to be posted from the inventory records. At the close of each month the overhead is to be computed upon the direct labor for each department and posted to the cost sheets. When the cost summaries are prepared for each style of the finished articles, the amount of the overhead absorbed thereon is to be credited to the overhead cost sheets. The balance on the overhead cost sheets will then represent the overhead applicable to the labor performed on the work in process of manufacture.

Cost sheets are to be opened for each of the shop orders issued. The materials purchased for the work on shop orders are to be charged direct to the Work in Process account and to the cost sheets for the shop orders from the purchase invoices. The labor is to be charged from the payroll distribution, and upon the completion of the orders, the overhead is to be added and credited to the overhead cost sheets. The cost of the shop orders when completed is to be charged to the account in the general ledger under which the work may be classified, and the cost sheet is then withdrawn from the current binder and filed as completed.

A controlling account for the work in process will be carried in the general ledger. It will be debited with the total cost of the work in process at the first of the month as shown by the inventory record. It will also be debited with the total cost of all materials used in production or for shop orders, the total wages paid for direct labor, and the proportionate amount of overhead thereon. It will be credited with the cost of the articles and shop orders completed during each month. The balance will represent the cost of the work still remaining in process at the close of each month.

Cost Summary for Articles Completed

At the close of each month, a cost summary (Figure 33)

is to be prepared for each style of the articles completed during the month. The quantity of each kind of article completed, as reported by the finished stock keeper, is to be entered in the space provided at the top of the summary. The detailed specifications for the manufacture of the article are to be entered at the left of the summary. The unit cost of the material used, the operations required to make the article, and the overhead to be added, are to be entered in the first column to the right

SUMMARY OF COST -- COMPLETED ARTICLES

MONTH OF ..... QUANTITY COMPLETED..... STYLE NO.....

Specifications	Cost						
	Per Hundred			Total			

FIGURE 33.—Summary of Cost—Completed Articles

of the specifications. The unit costs are to be taken from the respective work in process cost sheets. The cost of the individual items listed in the specifications is then to be extended in the next column for the total quantity completed during the month, and credited to the respective cost sheets. The two columns on the summary are then to be added to determine the unit and total cost of the articles completed during the month.

The total cost of all the articles completed during the month is to be charged to the Finished Stock account and credited to the Work in Process account.

Monthly Journal Entries

The following journal entries are to be made at the close of each month in order to perpetuate the inventory figures, to control the cost records, and to prepare the accounts in the general books so that the balances therein may be used, without further adjustment, in the preparation of the monthly financial and profit and loss statements.

Journal Entry No. 1

Dr.—Work in Process
  Cr.—Raw Material
Total cost of raw material withdrawn for production, from summary of reports of materials cut for the month.

Journal Entry No. 2

Dr.—Various Expense Accounts (Per charges to Standing Orders)
Dr.—Work in Process
  Cr.—Accrued Payrolls
Distribution of factory payrolls for the month, from summary of time tickets.

Journal Entry No. 3

Dr.—Work in Process
  Cr.—Overhead Distributed—Cutting Department
  Cr.—Overhead Distributed—Sewing Department
Total overhead absorbed by the productive labor and charged to overhead cost sheets.

Journal Entry No. 4

Dr.—Finished Stock
  Cr.—Work in Process
Total cost of articles completed and delivered to finished stockroom, from cost summaries for articles completed during the month.

Journal Entry No. 5

Dr.—Various Equipment Accounts
Dr.—Various Expense Accounts
  Cr.—Work in Process
Total cost of shop orders completed during the month.

Journal Entry No. 6

Dr.—Supplies Used
  Cr.—Finished Stock
Total cost of supplies used, from summary of reports for the month.

Journal Entry No. 7

Dr.—Cost of Sales
    Cr.—Finished Stock
Total cost of completed articles sold and delivered to customers during the month, from summary of sales.

Outline of Inventory Accounts

The posting of the foregoing entries to the inventory accounts outlined in the following is designated by the journal entry number. All other postings come from the books of original entry through the regular bookkeeping routine.

Raw Material

Debit	*Credit*
Inventory at start of period. Purchase of raw materials.	Raw materials returned to shipper from whom purchased. Raw materials withdrawn for production during the month, from reports of materials cut. (J. E. No. 1.)

The balance at the close of each month in this account represents the cost of the raw material on hand in the raw material stockroom.

Work in Process

Debit	*Credit*
Inventory at start of period. Purchases made for and charged directly to shop orders. Raw materials withdrawn for production during the month, from reports of materials cut. (J. E. No. 1.) Direct Labor, from distribution of payrolls for the month. (J. E. No. 2.) Overhead absorbed on direct labor for the month. (J. E. No. 3.)	Articles completed during the month, from cost summaries for articles completed. (J. E. No. 4.) Shop orders completed during the month, from cost sheets. (J. E. No. 5.)

The balance at the close of each month in this account represents the cost of all work in process of manufacture, and should agree with the total of the balances on all cost sheets.

FINISHED STOCK

Debit	*Credit*
Inventory at start of period.	Supplies withdrawn from stock for use in sewing machine department, from report of supplies used. (J. E. No. 6.)
Purchase of supplies for the sewing machine department to be carried in stock.	Articles shipped to customers during the month, from summary of sales. (J. E. No. 7.)
Articles completed and delivered to stockroom during the month, from summaries for articles completed. (J. E. No. 4.)	

The balance at the close of each month in this account represents the cost of all completed articles and supplies on hand, and should agree with the total cost of the items shown on the individual stock record cards.

INDEX

A

Accounting Treatment of Factory Orders, 24
Accrued Payroll, 43
Administrative Costs, 28 (See also "Marketing Costs")
  methods of, 27-30
  order or job method of, 27
Articles Completed,
  cost summary, illustrated, unit cost system, 226
  illustrated, unit cost system, 223

B

Burden (See "Overhead")
Business,
  volume required, determining, 147-158
Business Cycles,
  effect on profits, 114

C

Capacity (See "Operating Capacity")
Commercial Expenses (See also "Marketing Costs")
  as item in profit and loss statement, 105
  direct, 126
  fixed, 126
Controlling Accounts, 70-79
  accrued payroll, 79
  finished parts stores, 77
  illustrated, 72-79
  ledger entries, 75
  need of, 70
  number of, 71
  overhead distributed, 78
  work in process, 76
Cost Accounting,
  defined, 3
  purpose of, 3
  tool of management, 3-6
Cost Controlling Accounts (See "Controlling Accounts")
Cost Methods,
  variations in, 161
  vary with production methods, 162
Cost of Sales (See "Sales, Cost of")
Cost Record, Comparative,
  order or job system, 183
Cost Sheets,
  illustrated, order or job system, 179-181
  process cost system, illustrated, 201
  unit cost system, 212, 223
Cost Summary,
  unit cost system, 214
Cost System,
  advantages, 110
  concrete case assumed, 13
  functions of, 100
  installation of, 35
  operation of, 13-19
  order or job system, hypothetical case, 165-189
  preliminary survey of plant operations, 162
  suiting to existing conditions, 161
  value of, 100
Cost Variations,
  causes when normal overhead rates are used, 125
Costs (See also "Expense")
  changes in variable cost items, 153

direct and indirect, 7-12 (See also "Direct Costs," "Indirect Costs")
element of, 7
reduction of, effect on profits, 4
Credit Balance in Unabsorbed Overhead Account, 122

D

Departmental Costs, 54, 61
direct and joint, 85
Departmental Expenses (See "Departmental Costs")
Departmental Overhead Expenses (See "Overhead, Departmental Expenses")
Depreciation as Overhead, 89
Depressions (See "Business Cycles")
Deviation from Normal Operations, effects of, illustrated, 127-146
Direct Cost Orders, 21
classified, 25
Direct Costs,
apportioning in the office, 11
defined, 9, 11
treatment of insignificant items, 9
Direct Departmental Costs (See "Departmental Costs")
Direct Labor Cost Method in Distributing Overhead,
explained, 62
Direct Labor Hour Method in Distributing Overhead,
explained, 65

E

Expense (See also "Commercial Expenses," "Costs," "Fixed Expenses," "Producing Expense")
as item in profit and loss statement, percentage of, to sales and cost of sales, 103
classification, 50
general, as overhead, 91
handling as direct costs, 10
Expense Orders (See "Direct Cost Orders")

F

Factory Costs, 7, 20-26, 52 (See also "Manufacturing Costs")
determining, 117
effect on inventory, 119
Financial Depressions (See "Business Cycles")
Financial Statement (See "Profit and Loss Statement")
Fixed Expense, 88, 107, 117
basis of distribution, 118
defined, 57
Fixed Overhead (See "Overhead, Fixed")
Forms, 80-82

G

General Overhead Statements, 86
Graphic Chart,
showing amount of business necessary to overcome an experienced loss when production equals sales requirements, 156
showing business necessary to overcome experienced loss, 149
showing effect of changes in selling price and variable items of cost, 154
showing operating results from different volumes of business, 143

H

Heat as Overhead, 91

I

Indirect Costs,
defined, 9, 11
Insurance Cost as Overhead, 90
Internal Orders (See "Direct Cost Orders")

Inventory, 35
effect of factory expenses on, 119
eliminating increase in, 153
order or job system, hypothetical case, 166
process cost system, 191
unit cost system, 209-211
Inventory Accounts, Illustrated, order or job systems, 187
Inventory Values and Overhead, 107

J

Job System (See "Order or Job System")
Joint Departmental Costs (See "Departmental Costs")
Journal Entries, Monthly, illustrated, unit cost system, 227
order or job system, 186
process cost system, 205

L

Labor Costs (See also "Overhead") 43-49
accounting, 43
proration, 62
records, 43-49
treatment of, 9, 11
under operating unit method, 48
under order or job method, 46
under process method, 47
Ledger Accounts, Outline, process cost system, 207

M

Machine Hour Method in Distributing, explained, 66
Manufacturing Costs (See also "Factory Costs")
as item in profit and loss statement, 109
Marketing Costs, 8, 52 (See also "Commercial Expenses")
Material (See "Raw Material")
Material Costs, 31-42
accounting system for, 32
direct and indirect, 11, 33
Material Cut, Report of, unit cost system, illustrated, 219
Material Used, Report of, process cost system, illustrated, 197-199

N

Nonproductive Departments, 56

O

Operating Capacity, normal, 58
Operating Unit Method (See "Labor Costs")
Operation, Normal, effects of deviation from, illustrated, 127-146
Order Method, 13-26
Order or Job System (See also "Labor Costs")
hypothetical case, 165-189
general outline, 168
in operation, 170
statement of conditions, 165
Orders, order or job system, hypothetical case, 172
quantity in, 21
Other Revenues, as Item in Profit and Loss Statement, 104
Overhead, allocation of, in contract shops, 125
amount chargeable, how determined, 58
and inventory values, 107
classified, 57
defined, 9, 12, 50-59
departmental expenses, 86
determining amount, 50
distributed to costs, 97

distribution, 60-69
direct labor hour method, 65
labor cost method, 62
machine hour method, 66
methods of, 61
under process cost system, illustrated, 203
unit of production methods, 68
fixed,
and volume of production, 116
budget, 139
normal rates of, cost variations despite, 125
unabsorbed,
administrative department's responsibility for, 121
as item in profit and loss statement, 106
cause and effect, 114-122
credit balance in account, 122
effect of, illustrated, 123-146
production department's responsibility, 120
sales department's responsibility for, 120
Overhead Distributed Account, 109
Overhead Orders, 21
classified, 25
Overhead Statements, 59, 85-99
items explained, 88
manufacturing, illustrated, 87

P

Payroll, Accrued (See "Accrued Payroll")
Power as Overhead, 94
Prices,
changes in setting, 153
establishing selling, 111
folly of increasing, in time of depression, 123
how determined, 4
minimum selling, 112
Process Cost System, illustrated, 190-207
Process Method (See "Labor Costs")
Producing Expense, 57, 88, 108, 117
Production,
and sales varying in different ratios, 158
maintaining normal, 123
volume of, importance of maintaining in period of depression, 115
Production and Shop Orders,
order or job system, hypothetical case, 169
Production Methods and Cost System, 25
Production Orders,
classified, 25
process cost system, 191, 194
separate, 20
Production Record,
unit cost system, 211, 221-222
Productive Departments, 55
Profit and Loss Statement, 100-113
analysis, 101
illustrated, 101
percentages in, 101
showing unabsorbed overhead, 148
Profits,
normal, less than unabsorbed fixed expenses, 147
Prosperity,
providing for lean years in periods of, 114

R

Raw Material, 36 (See also "Material")
Receiving Slips, 39,
order or job system, illustrated, 175
process cost system, 196
unit cost system, 218
Records,
finished stock, illustrated,
unit cost system, 216-217

primary, in order or job system, hypothetical case, 168
raw material stock, unit cost system, 215
stock and cost sheets, process cost system, 192
stock cards, 172, 173
process cost system, 194
stock, forms, 37
Repair Orders, Illustrated, order or job method, 185
Repairs as Overhead, 93
Report of Weight and Finished Castings, process cost system, illustrated, 199
Requisitions, 40
order or job system, illustrated, 177
Return Purchase Slips, 39
order or job system, illustrated, 176, 177
process cost system, 197

S

Salaries as Overhead, 88
Sales,
and cost of sales, as item in profit and loss statement, percentage of expense to, 103
and production varying in different ratios, 158
as item in profit and loss statement, 110
cost of, as item in profit and loss statement, 105
counteracting decline, 123
Sales Price (See "Prices")
Sales Summary, unit cost system, 214
Selling Costs (See "Marketing Costs")
Shipping Orders, 42
order or job system, 185
Shipping Reports, Illustrated, process cost system, 204
Shop Orders,
process cost system, 194
unit cost system, 214
Standing Orders, 22
order or job system, hypothetical case, 169
process cost system, 194
unit cost system, 215
Stock Records (See "Records")
Stockrooms, 36
order or job system, hypothetical case, 166

T

Time Tickets, 44
order or job system, 178
process cost system, 201
unit cost system, 220
Transfer Slips, 40
order or job system, 181-182

U

Unabsorbed Overhead (See "Overhead, Unabsorbed")
Unit Cost System, illustrated, 208-229
Unit of Production Method in Distributing Overhead, explained, 68

V

Volume of Business (See "Business")

W

Wages as Overhead, 92

1225
Sheet
300

UNIVERSITY OF ILLINOIS-URBANA
3 0112 066880722